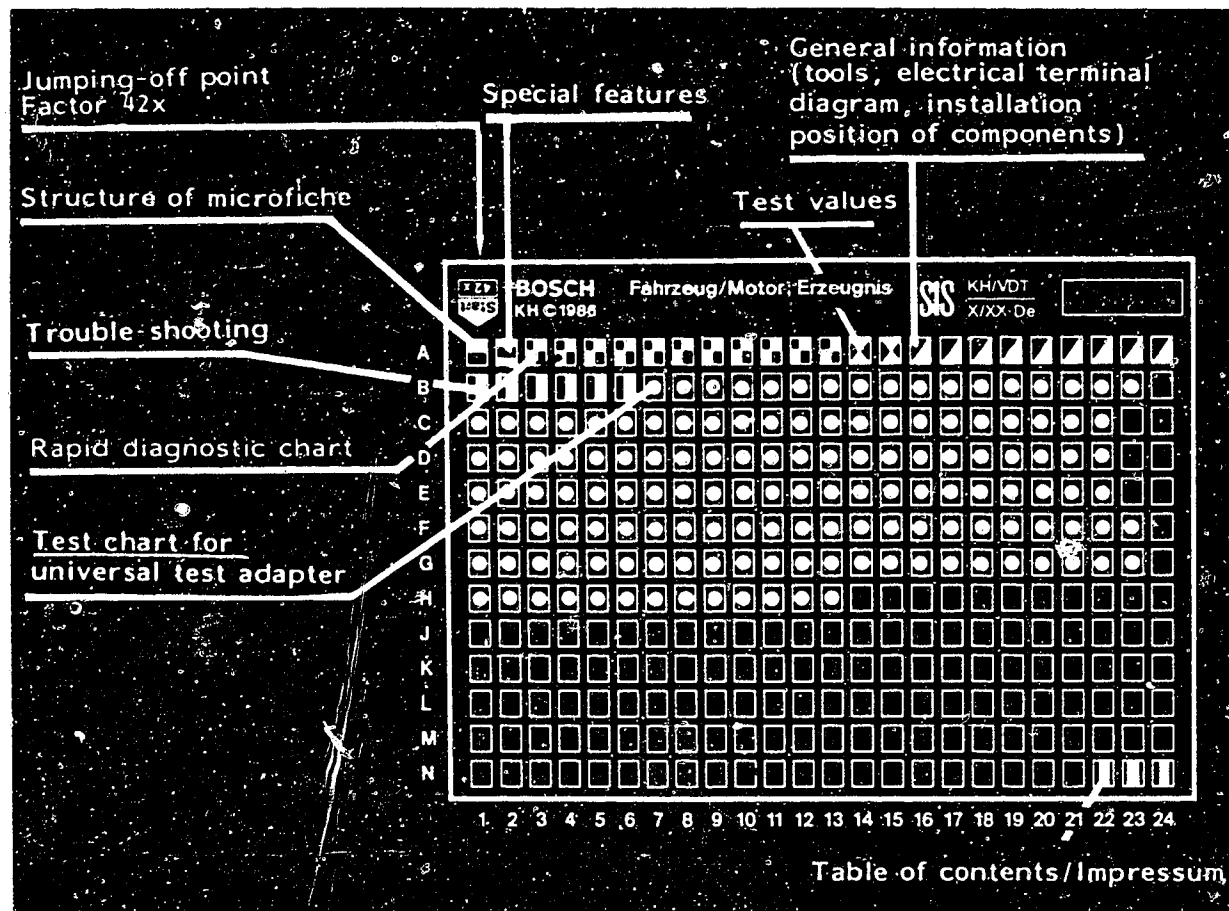


Structure of microfiche



1. Read from left to right
2. Title of microfiche (appears on each coordinate)

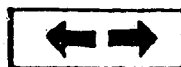
E16	Product/component/test step
	Vehicle/engine

Coordinate

3. Limits of section



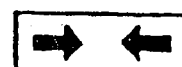
Beginning



Mid-section



End



One-page section

A1	Repair and testing
-----------	--------------------

1. Special features

This microcard contains the trouble-shooting instructions for the Ecotronic electronic mixture-formation system with lambda closed-loop control.

This microcard applies to the following models valid at the time of writing:

Mercedes-Benz

Type W 124 -200, 200 T

Type W 201 - 190



2. Rapid diagnosis chart for universal test adapter

The following rapid diagnosis chart makes it possible for the experienced Ecotronic specialist to rapidly check the electric part of the system using the universal test adapter.

The rapid diagnosis chart contains the following information:

- Switch positions on universal test adapter
- Test-step sequence
- Remarks on the operation of the universal test adapter and other components.
- Readings on multimeter or oscilloscope
- Reference to coordinates of the respective detailed test and trouble-shooting program.

If more detailed information and instructions are necessary, always proceed per trouble-shooting starting on Coordinate B1/B2.

Requirements for testing

- Engine in good mechanical order (valve timing, compression, etc.).
- Ignition system and starting device in good order
- Engine at operating temperature
- Set idle CO to 0.5...0.7 vol. % CO with idle-mixture-adjusting screw (only on vehicles without lambda closed-loop control).
- Connect jacks 1 and 2 on universal test adapter (short circuit).

Note!

- Make sure that jack 1 does not come into contact with ground (e.g. black test jacks). This would destroy, i.e. cause irreparable damage to, the control unit.
- Before disconnecting the control-unit plug or the adapter cable from the control unit always wait at least 20 seconds after switching off the ignition.



Rapid diagnosis chart for universal test adapter (continued)

Test step	Switch position		Remarks	Test specification (reading)	Trouble-shooting see Coordinates
	Ω	V			
1	1	↓	Bridge jacks 1/2 on universal test adapter. Ignition off, control unit not connected. Insulation resistance of choke-valve actuator (terms. 12/2)	$> 1 \text{ M } \Omega$	B 14
2	3	↓	Winding resistance, choke-valve actuator (terms. 12/10)	$< 10 \text{ } \Omega$	B 18
3	5	↓	Resistance of temperature sensor, coolant (terms. 21/2)	+ 20°C: $2 \text{ k} \Omega \dots 3 \text{ k} \Omega$ + 80°C: $280 \text{ } \Omega \dots 360 \text{ } \Omega$ temperature-dependent	B 22
4	7	↓	Resistance of ground leads (terms. 20/2)	$< 10 \text{ } \Omega$	C 1
5	12	↓	Resistance of solenoid-operated valve (evacuating) in in throttle-valve positioner (terms. 9/2)	$20 \text{ } \Omega \dots 80 \text{ } \Omega$	C 3
6	13	↓	Resistance of solenoid-operated valve (ventilating) in throttle-valve positioner (terms. 3/2)	$20 \text{ } \Omega \dots 80 \text{ } \Omega$	C 9
7	15	↓	Only on vehicles with manual transmission (gear recognition) (terms. 16/2)	$< 10 \text{ } \Omega$	C 15
8	20	↓	Resistance of throttle-valve potentiometer and potentiometer in throttle-valve positioner (parallel) (terms. 18/7)	$0.7 \dots 1.3 \text{ k} \Omega$	C 17
9	21	↓	Resistance of adjustment plugs for electronic control unit. ECE adjustment plug. For instructions on adjustment plug, see detailed trouble-shooting starting on Coordinate C23. (terms. 22/7)	$50 \dots 600 \text{ } \Omega$	D 1
			KAT adjustment plug. For information on adjustment plug see detailed trouble-shooting starting on Coordinate C 23	$950 \text{ } \Omega \dots 11.4 \text{ k} \Omega$	

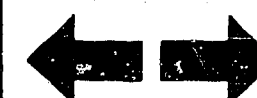
A4

Rapid diagnosis chart
Mercedes-Benz



A5

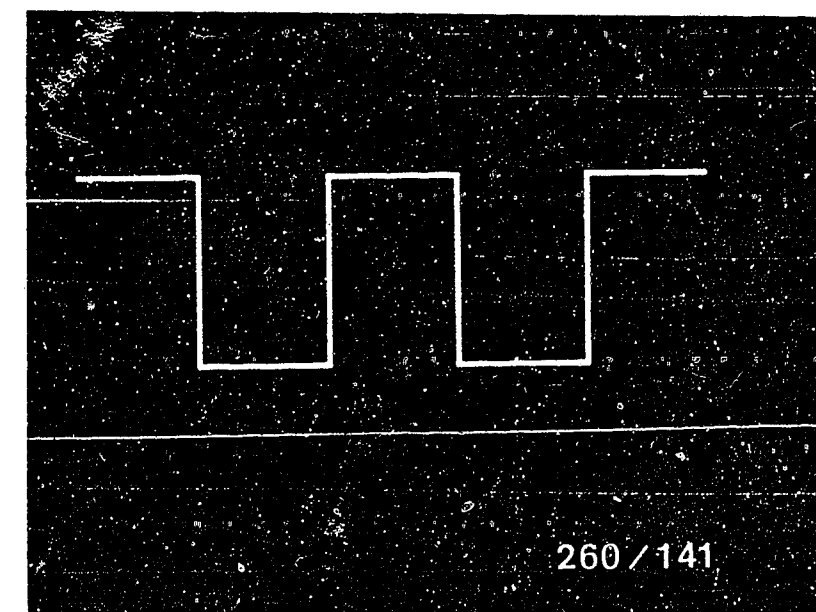
Rapid diagnosis chart
Mercedes-Benz



Rapid diagnosis chart for universal test adapter (continued)

Voltage measurements: connect control unit: switch on ignition

Test step	Switch position		Remarks	Test specifications (reading)	Trouble-shooting see Coordinates
	Ω	V			
10	21	3	Supply voltage for control unit (terms. 1/2)	> 10 V	D 5
Connect ignition oscilloscope to black test inlet of universal test adapter with black terminal and to red test inlet with red terminal.					
11	21	5	Engine runs at operating temperature; engine-speed signal measurement (or pulses during starting) (terms. 25/2)	See upper illustration	D 7
12	21	6	Voltage supply term. 15, start engine (terms. 13/2)	> 10 V	D 9
13	21	7	Voltage supply for potentiometer (throttle valve and throttle-valve positioner) (terms. 18/2)	4.5 ... 5.5 V	D 11
14	21	8	Voltage supply, intake-manifold heating. Engine running: engine temperature still < 65°C (terms. 14/2)	> 10 V	D 13
15	21	9	Air-conditioning recognition. Press AC button on air-conditioning control section. Switch on fan. (terms. 19/2)	> 10 V	D 15



A6

Rapid diagnosis chart

Mercedes-Benz



A7

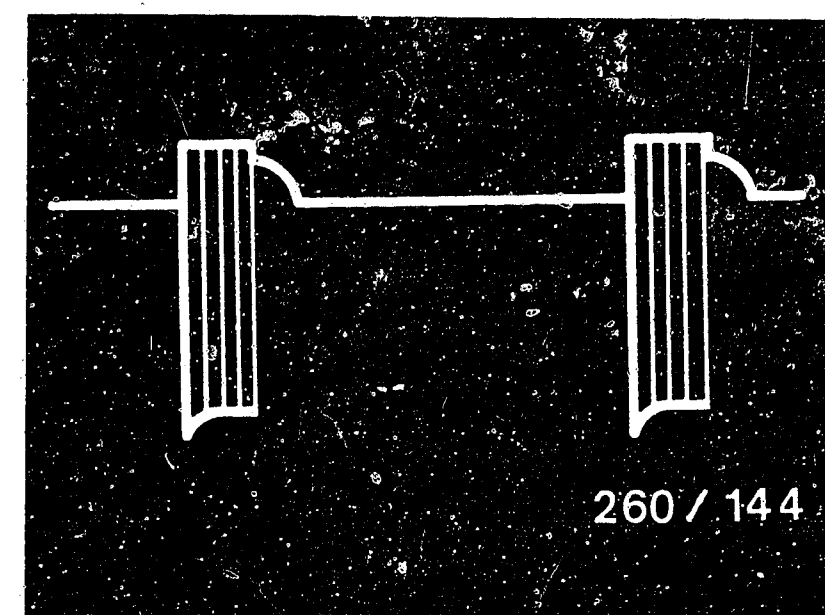
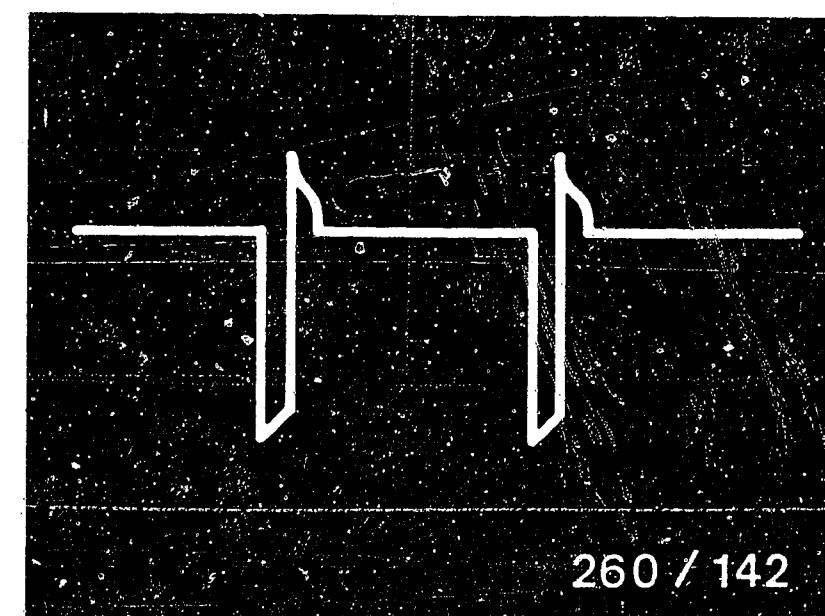
Rapid diagnosis chart

Mercedes-Benz



Rapid diagnosis chart for universal test adapter (continued)

Test step	Switch position		Remarks	Test specification (reading)	Trouble-shooting see Coordinates
	Ω	V			
16	21	10	Inspect throttle-valve positioner. Remove jumper on jacks 1 and 2 on universal test adapter. Press button T4 on universal test adapter. Tappet of throttle-valve positioner moves into over-run position. Engine cuts off. Value must not change by more than 0.2 V within 30 sec. (terms. 17/2)	0.1 ... 0.8 V after 30 sec. + max. 0.2 V	D 17
17	21	11	Check throttle-valve potentiometer. Slowly press accelerator pedal from idle to full-load position. Voltage continuously rises from min. to max. (no voltage jumps) (terms. 11/2)	Min.: 0.05 ... 0.6 V Max.: 4.2 ... 5.5 V	E 1
18	21	10	Test throttle-valve positioner (vent. side). Connect lead from jack 2 on universal test adapter to positive for 1 sec. (e.g. battery positive)	2.8 ... 4.2 V	E 3
19	21	12	Measurement of signal for choke-valve actuator. Rebridge jacks 1 and 2 on universal test adapter. Start engine. (terms. 12/2)	See upper illustration	E 7
20	21	12	Measurement of signal for choke-valve actuator. Press button T1 on universal test adapter → signal becomes wider. (terms. 12/2)	See lower illustration	E 11



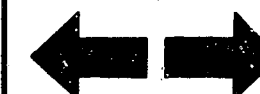
A8

Rapid diagnosis chart
Mercedes-Benz



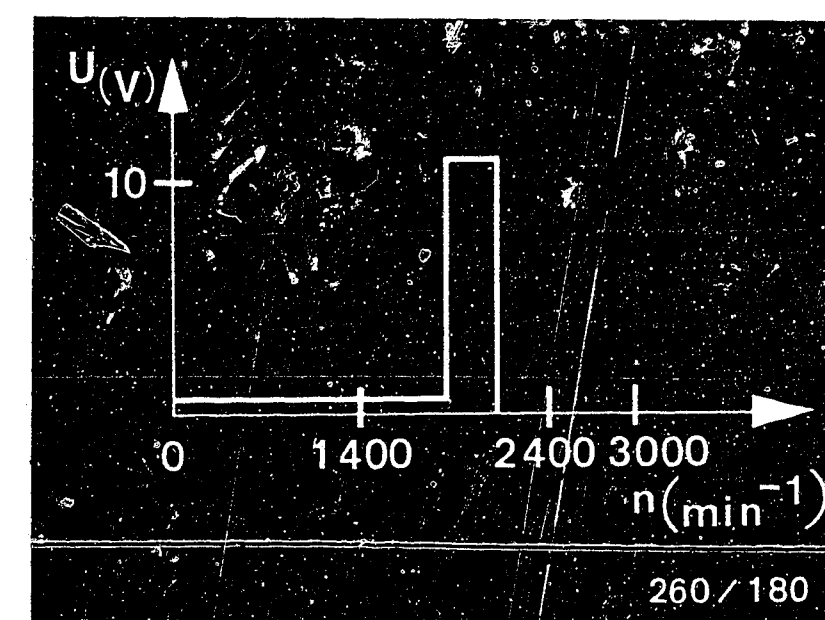
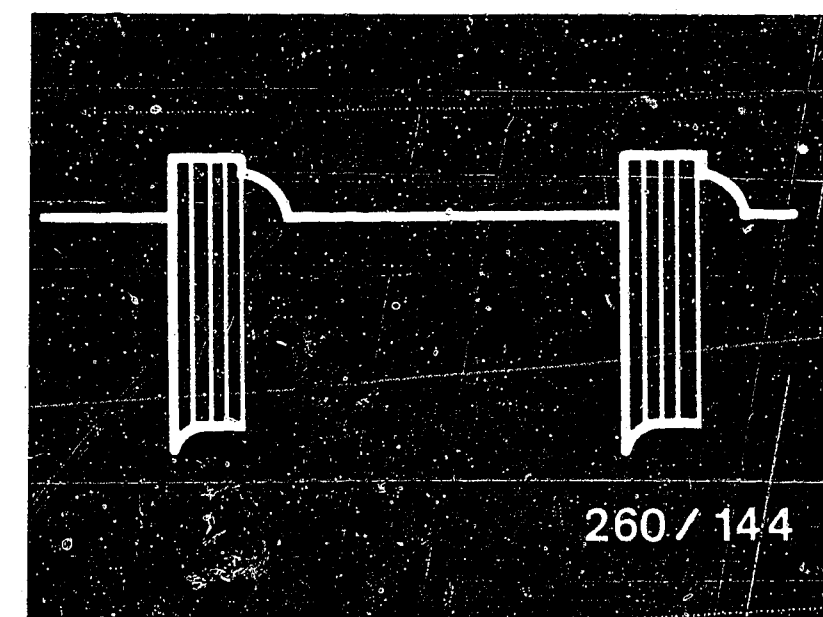
A9

Rapid diagnosis chart
Mercedes-Benz



Diagnosis chart for universal test adapter (continued)

Test step	Switch position		Remarks	Test specification (reading)	Trouble-shooting see Coordinates
	Ω	V			
21	21	12	Measurement of signal for choke-valve actuator. (Acceleration enrichment). Briefly press accelerator pedal → signal becomes wider (terms. 12/2)	See upper illustration	E 13
22	21	13	Test overrun cut-off. Maintain engine at approx. 3000 1/min. Keep button T4 pressed and release gas pedal. (terms. 3/2)	Between 2400 ... 1400 1/min briefly > 10 V (lower illustration)	E 15
23	21	13	Voltage at ventilating valve in throttle-valve positioner. Observe time! Switch off ignition. (terms. 3/2)	Ignition off: < 1 V after approx. 1...3 sec. > 10 V after further approx. 1...5 sec. < 1 V	E 17
24	21	14	Start engine. Voltage at evacuating valve in throttle-valve positioner. Observe time! Switch off ignition (terms. 9/2)	< 1 V ignition off: > 10 V after approx. 3 sec. < 1 V	E 19



A10

Rapid diagnosis chart
Mercedes-Benz



A11

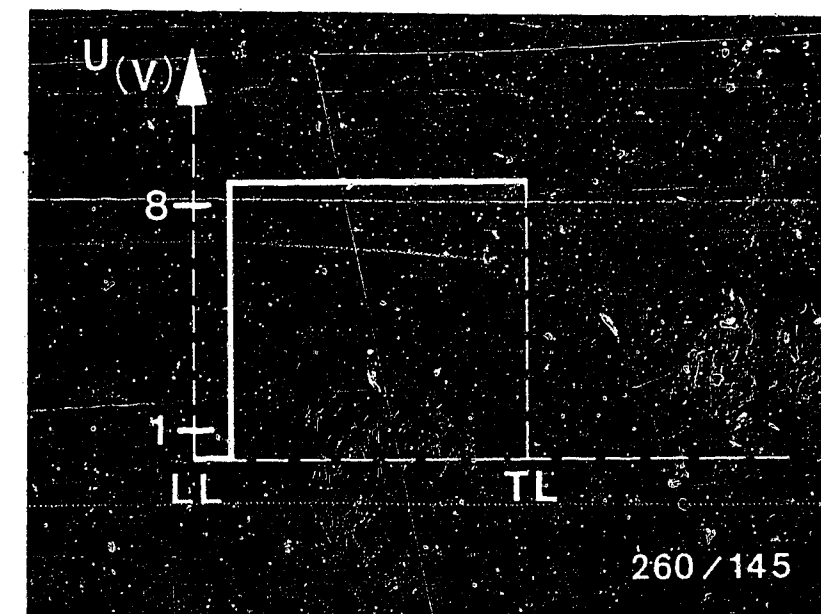
Rapid diagnosis chart
Mercedes-Benz



Test chart for universal test adapter (continued):

Test step	Switch position		Remarks	Test specification (reading)	Trouble-shooting see Coordinates
	Ω	V			
25	21	18	Driving position switch (only on automatic transmission). Start engine. Driving-position selector lever in "P". (terms. 16/2)	During starting > 8 V	E 21
26	21	4	Lambda closed-loop control, open-loop control value at integrator output. Engine at operating temperature and running in idle (terms. 23/2)	5 ... 7 V (note down value)	F 1
27	22	4	Lambda closed-loop control, rich value at integrator output. Connect analog measuring device to test jacks of universal test adapter. Hold engine at speed of > 2000 min ⁻¹ . (terms. 23/2)	< 2	F 3
28	23	4	Lambda closed-loop control, lean value at integrator output. Hold engine at speed of > 2000 min ⁻¹ (terms. 23/2)	> 9 V	F 5
29	24	4	Lambda closed-loop control, closed-loop control value at integrator output. Test value oscillates (± 0.5 V) around the control value determined in test step 26. (terms. 23/2)	5 ... 7 V	F 7
30	21	23	Idle signal for EZL control unit. Let engine run in idle. Very slowly depress accelerator pedal from idle to part-load position. (terms. 6/2)	See upper illustration	F 11
31	21	23	Only on vehicles without lambda closed-loop control ! (RÜF vehicles*) Connect CO tester. Press button T1	1.0 \pm 0.5 vol. % CO 3...6 vol. % CO	F 13

* West Germany only



LL = Idle
TL = Part load

A12

Rapid diagnosis chart

Mercedes-Benz



A13

Rapid diagnosis chart

Mercedes-Benz



3. Test specifications

Idle speed:

$740 \pm 40 \text{ min}^{-1}$

Exhaust adjustment:

CO value with engine at
operating temperature:
(Only on RÜF vehicles)

$1.0 \pm 0.5 \text{ vol. \% CO}$

Temperature sensor (coolant)

Resistance at

$+20^{\circ}\text{C}: 2.2 \dots 2.8 \text{ k}\Omega$

$+80^{\circ}\text{C}: 290 \dots 364 \text{ }\Omega$

Float weight: (dry)

$7.9 \pm 0.5 \text{ g}$

Float/level:

$27.5 \pm 1.0 \text{ mm}$

Bypass heating (resistance):

at $+20^{\circ}\text{C}$ approx $2.7 \text{ }\Omega$

Intake-manifold pre-heating
(resistance):

at $+20^{\circ}\text{C}$ approx. $1.2 \text{ }\Omega$

Throttle-valve potentiometer

Total resistance:

$1.4 \dots 2.6 \text{ k}\Omega$

Wiper resistance in
control range

min. $< 270 \text{ }\Omega$

max. $1.4 \dots 2.4 \text{ k}\Omega$

Choke-valve actuator

(winding resistance):

$0.9 \dots 1.7 \text{ }\Omega$

Throttle-valve positioner:

Evacuating valve (connec-
tion 2+3):

$20 \dots 70 \text{ }\Omega$

Ventilating valve (connec-
tion 2+8):

$20 \dots 70 \text{ }\Omega$

Total potentiometer re-
sistance (connection 4
and 5):

$1.4 \dots 2.6 \text{ k}\Omega$

Wiper resistance in
control range (connection
4 and 7)

min. $< 400 \text{ }\Omega$

max. $1.4 \dots 2.4 \text{ k}\Omega$

Lambda closed-loop control
integrator measurement
output:

Open-loop

control value : $5 \dots 7 \text{ V}$ or 50 % on-off ratio

Rich value: : $< 2 \text{ V}$ or $> 80 \text{ \% on-off ratio}$

Lean value : $> 9 \text{ V}$ or $< 20 \text{ \% on-off ratio}$

Closed-loop

control value : $5 \dots 7 \text{ V}$ (fluctuates around
closed-loop control
value)



Basic setting of throttle
plate, stage II:

$0.02 \pm 0.02 \text{ mm}$

Release and positive
return, stage II:

$y = 0.8 \pm 0.2 \text{ mm}$

$z = 0.4 \pm 0.2 \text{ mm}$

Resistance of lambda-
sensor heating element:

at + 20°C 4.3 Ω

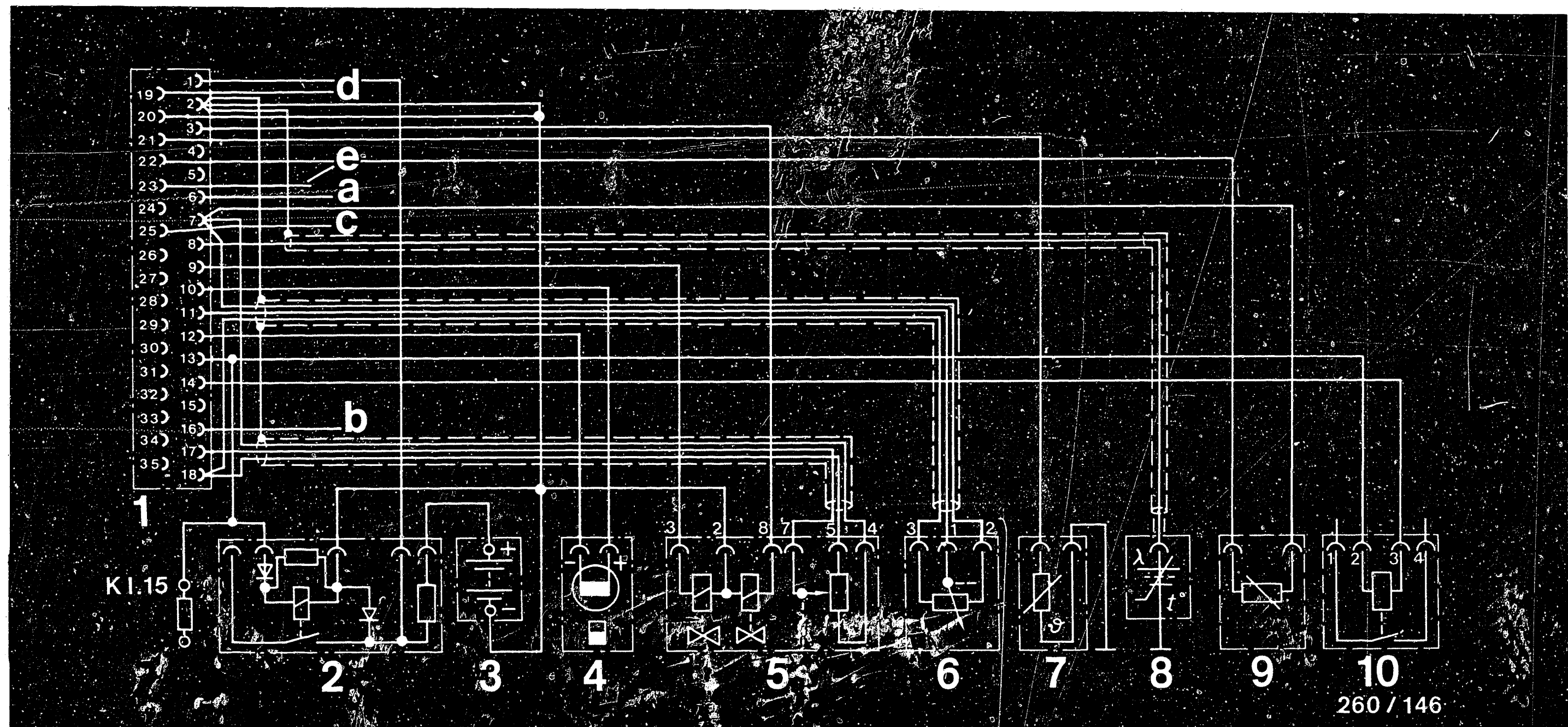
Enrichment pipe

Height above pre-atomizer:

$13.5 \pm 1 \text{ mm}$

For setting values for ignition, valve play and other technical engine data, see equipment and Autodata microcard.





4. Electrical terminal diagram of Ecotronic

- 1 = Ecotronic control unit
- 2 = Over-voltage protection relay
- 3 = Battery
- 4 = Choke-valve actuator
- 5 = Throttle-valve positioner
- 6 = Throttle-valve potentiometer
- 7 = Temperature sensor
- 8 = Lambda sensor

- 9 = Encoding plug
- 10 = Control relay for intake-manifold heating

- a = Idle output for EZL control unit
- b = Via start-locking switch to solenoid-operated switch term. 50 (automatic transmission mod. 190, 200)

To engine ground (mod. 190 manual terms.). to solenoid-operated switch term. 50 (mod. 200, manual)

- c = TD signal
- d = To compressor cutoff unit
- e = Lambda closed-loop control integrator output

A16

Electrical terminal diagram

Mercedes-Benz

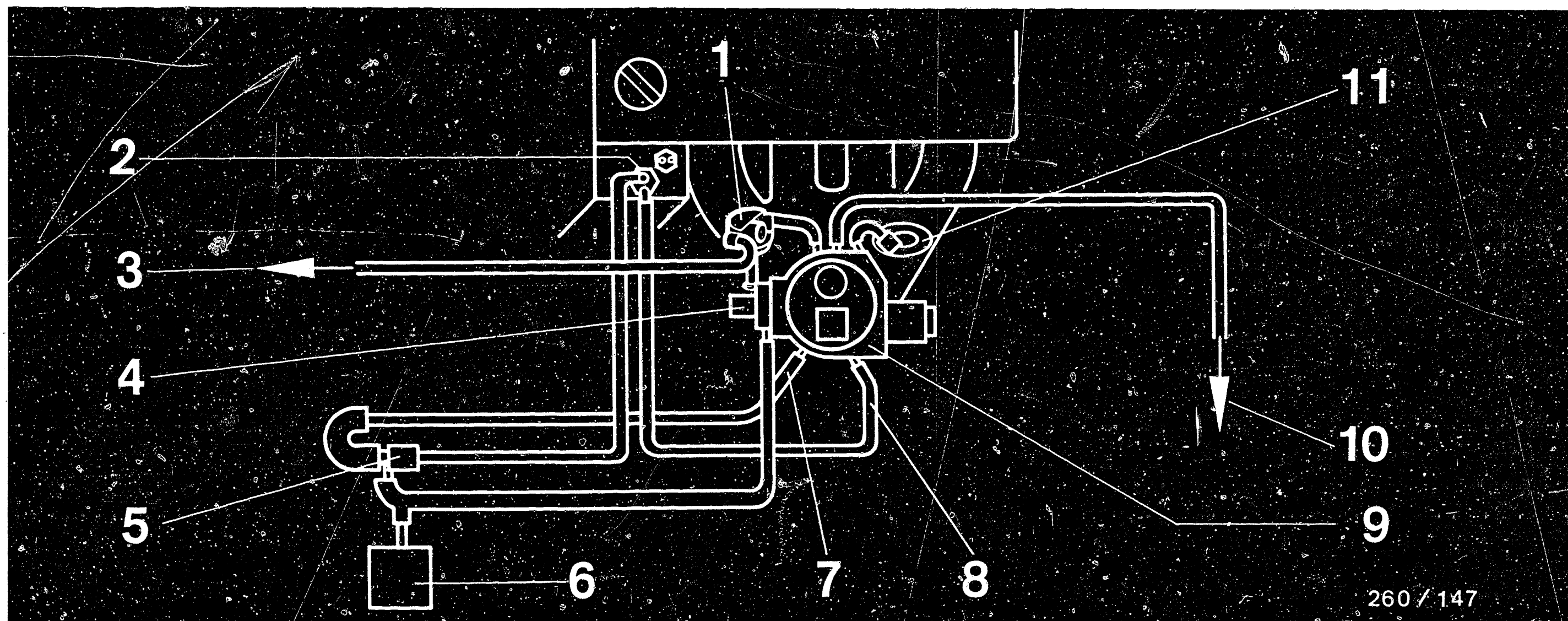


A17

Electrical terminal diagram

Mercedes-Benz





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5. Hose diagram, vacuum lines with regeneration device

- | | |
|---|---|
| 1 = Throttle-valve positioner | 8 = Control line for regeneration |
| 2 = Thermo-valve (opens at 50°C coolant temperature) | 9 = Carburetor |
| 3 = In vehicle interior | 10 = To ignition trigger box |
| 4 = Float-chamber switch-over ventilation valve (electr.) | 11 = Vacuum unit stage II |
| 5 = Pneumatic switch-over valve (opens at approx. 30 mbar vacuum) | 7 - 11 = Regeneration device (country-specific) |
| 6 = Activated-carbon filter | |
| 7 = Regeneration line | |

- The lambda sensor is screwed into the forward exhaust pipe. Connection leads through the transmission tunnel into the passenger compartment.

A18

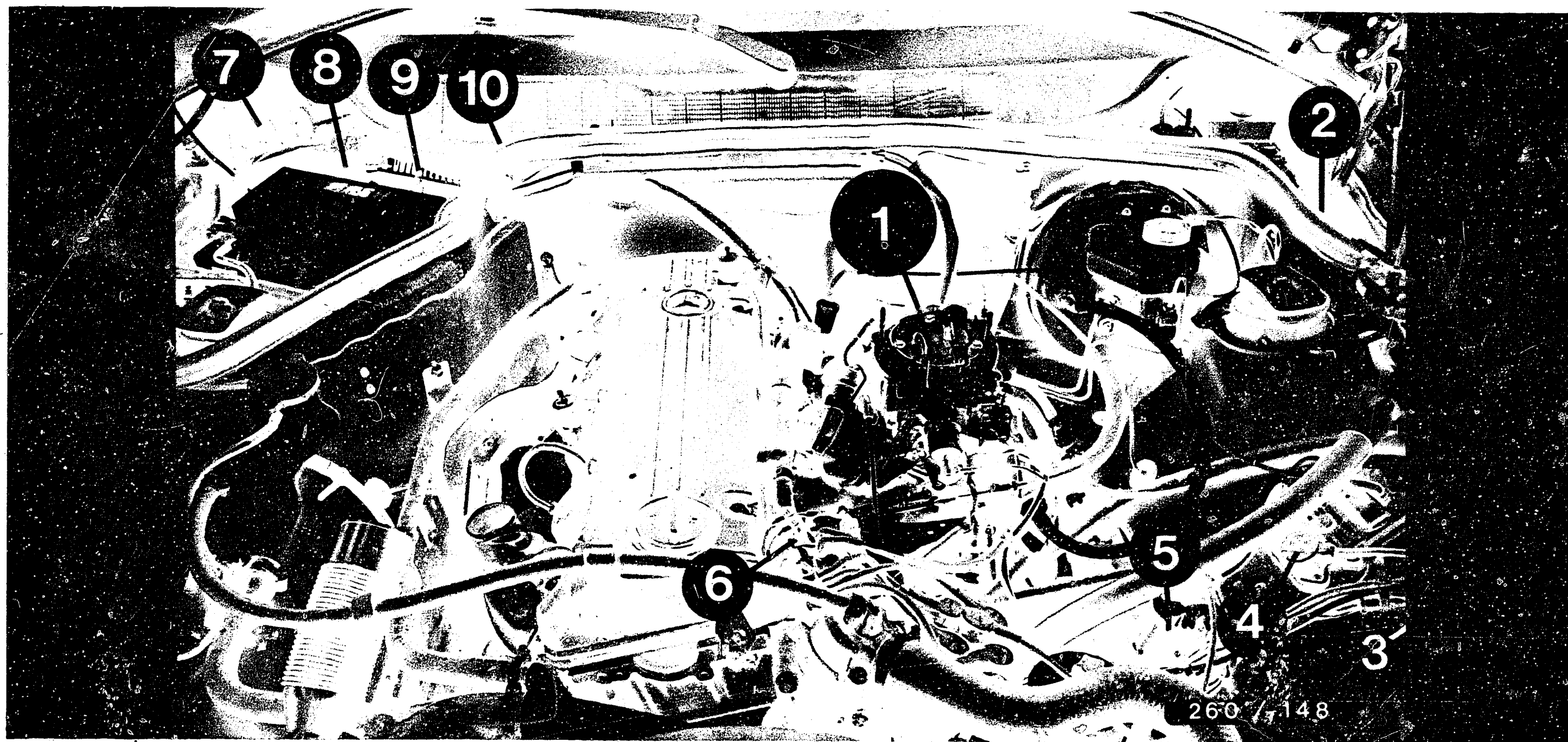
Hose diagram, vacuum lines
Mercedes-Benz



A19

Hose diagram, vacuum lines
Mercedes-Benz





6. Installation position of components:

- 1 = Carburetor
- 2 = Relay, bypass heating, and intake-manifold pre-heating
- 3 = Diagnostic unit
- 4 = EZL ignition trigger box

- 5 = Ignition coil
- 6 = Double temperature sensor for ecotronic and EZL control unit
- 7 = Control unit, compressor cutoff

- 8 = Over-voltage protection relay
- 9 = Ecotronic control unit
- 10 = Adjustment plug

A20

Installation position of components
Mercedes-Benz



A21

Installation position of components
Mercedes-Benz



7. Test equipment and tools

Description	Designation	Part no.
Universal test adapter	ETT 018.01	0 684 101 801
Adapter cable		1 684 463 ..
Motortester	e.g. MOT 002.00	0 684 000 200
Exhaust-gas tester	e.g. ETT 008.00	0 684 100 800
Pressure/vacuum tester	e.g. ETT 007.01	0 684 100 701
Feeler gauge for adjusting throttle-valve section (2.0 ± 0.05 mm)		Can be obtained from Korinth Co., Ludwig-Kloos-Strasse 21 6450 Hanau 7 - Steinheim West Germany
Measuring tool for throttle-valve adjustment		Can be obtained from Korinth company.
Corrosion-protection agent or Unispray "Termal"	WD 40	commerically available
Electric tester or multimeter	e.g. ETE 014.00 e.g. Philips Co. PM 2517 X e.g. Miselco Co. Master 50 K e.g. Chinaglia Co. Cortina	0 684 101 400
Vacuum pump	e.g. Mityvac	Can be obtained from Korinth company
λ closed-loop control tester	KDJEP - 600	
λ - sensor mounting paste	VS 140 16 Ft	5 964 080 105



8. Important general information

Always follow instructions, in order to prevent damage to the engine control unit, or ignition coil, as well as to preclude personal hazard.

1. Never start engine without battery firmly connected.
2. Incorrect polarity of supply voltage, e.g. due to incorrect connection of the battery or ignition coil, can lead to the destruction of the control unit.
3. Never use a fast charger to start the engine.

Give starting aid only with a second 12 V battery and jumper cable.

Careful!

Due to non-uniform requirements made by vehicle manufacturers on electronic products, we recommend that no 24 V battery be used for starting assistance. Observe the vehicle's operating instructions.

4. Separate the battery from the vehicle electrical system before quick charging.
5. When charging the battery in vehicle or starting aid, observe operating instructions of fast charger as well as those of the vehicle manufacturer.
6. Never disconnect the battery from the vehicle power supply when engine is running.
7. Do not short-circuit ignition coil term. 1 to ground (e.g. to shut off the engine). This would destroy the ignition coil, and under some conditions the control unit as well.



8. Never plug or unplug the wiring-harness plug of the control unit with the ignition switched on. After switching off the ignition wait approx. 20 seconds!
9. At temperatures above +80°C (paint-drying installation) remove the control unit.
10. The control unit must be removed prior to welding work (electrical spot welding).

Caution!

**High-energy ignition system.
Dangerous primary
and secondary voltages.**



The sticker illustrated here has the following significance:

The vehicle possesses a powerful ignition system, which in case of contact with voltage-carrying parts or terminals can be fatal (on both primary and secondary sides).



9. Trouble-shooting

The following trouble-shooting program begins with the trouble-shooting chart (B3...B6) in which reference is made after the symptom of trouble (customer complaint) to the corresponding possible causes.

In each "cause" column reference is made to the first coordinate of the test section in which the testing of this function is described in detail.

The trouble-shooting program has been set up so that direct trouble-shooting can be carried out on the basis of the trouble-shooting chart (B3...B6).

B1

Trouble-shooting
Mercedes-Benz

**B2**

Trouble-shooting
Mercedes-Benz



Trouble-shooting chart

Testing with the universal test adapter must come at the beginning of the testing program and must be carried out from beginning to end (see Coordinates B 7 - F 19). The table below contains various symptoms of trouble, each with several possible causes of trouble. The reference field gives the first coordinate of the test sequence for the respective individual Ecotronic components.

Customer complaint (symptom of trouble)

1. Engine fails to start or starts only with difficulty
2. Engine starts but then dies
3. Cold idle speed too high/too low
4. Poor driveability with engine cold, bucking
5. Poor engine idle
6. Idle CO not adjustable (RÜF vehicles)
7. Bucking during acceleration
8. Bucking during constant-speed operation
9. Hot-start problems
10. Insufficient power
11. Excessive fuel consumption
12. Engine speed not limited to 6200 rpm
13. Lambda closed-loop control range not adjustable

													Cause (component fault)	Coordinates
•	•	•	•	•	•	•	•	•	•	•	•	•	Testing with universal test adapter	B 7
•								•					Incorrect operation	F 15
	•	•	•	•	•	•	•					•	Leakage in vacuum system (air entry)	F 15
•	•			•			•	•	•				Fuel pressure outside tolerances	F 16
•	•		•	•		•	•	•	•	•			Fuel does not correspond to DIN standard	F 17
•	•		•	•	•	•	•	•	•				Filter in fuel supply line dirty	F 17
		•	•				•		•				Bypass heating defective	B 7 - F18
	•		•										Intake manifold pre-heating defective; intake-air pre-heating defective	B 7 - F18
•	•	•	•	•		•	•			•		•	Temperature sensor defective	F 23
				•	•	•	•		•	•		•	Exhaust system defective/lambda sensor defective	G 1, G 5
								•	•	•			Float-chamber switch-over valve defective	H 4
											•		Check engine-speed limiting	F 21



Customer complaint (symptom of trouble)

1. Engine fails to start or starts only with difficulty
2. Engine starts but then dies
3. Cold-idle speed too high/too low
4. Poor driveability with engine cold, bucking
5. Poor engine idle
6. Idle CO not adjustable (RÜF vehicles)
7. Bucking during acceleration
8. Bucking during constant-speed operation
9. Hot-start problems
10. Insufficient power
11. Excessive fuel consumption
12. Engine speed not limited to 6200 rpm
13. Lambda closed-loop control range not adjustable

											Cause (component fault)	Coordinates
									•	•	Throttle valve stage I does not fully open (close)	G 9
•	•	•	•	•	•	•	•	•	•	•	• Choke-valve plate/idle-air correction needle catches or cannot move freely.	G 11
•	•			•	•		•	•	•	•	Float defective / level incorrect, float needle sticks / valve leaks	G 15
			•			•	•		•	•	Nozzles other than prescribed	G 19
		•		•	•	•	•				Throttle plate unhinged	G 20
		•		•	•						• Adjustment of throttle-valve section (stage I) incorrect	G 21
			•				•		•		Stage II vacuum unit defective	G 23
				•	•	•	•		•		Basic setting of stage II throttle valve incorrect	G 24
									•		Release and positive return stage II incorrect	H 2
									•		Catalytic convertor defective/used up, replace	--
•	•	•	•	•	•	•	•		•	•	Dirt in carburetor / corrosion	H 5
			•			•				•	• Adjustment plug for electronic control unit incorrectly set	G 3
				•					•	•	Check EZL system (per SIS instructions)	--

B5

Trouble-shooting
Mercedes-Benz



B6

Trouble-shooting
Mercedes-Benz



10. Test chart for universal test adapter ETT 018.01
with connected adapter cable for Ecotronic

For the purpose of testing the wiring harness and the components connected to it, the Ecotronic adapter cable is connected only to the control-unit plug. In active testing starting with test step 10 the adapter cable is connected to the control unit as well.

Careful!

Before disconnecting the adapter cable or the control-unit plug from the control unit, always wait at least 20 seconds after switching off the ignition.

Connect a measuring instrument for voltage and resistance measurement (multimeter) to the test adapter, as well as to the motortester

The individual test steps are selected with the program switch. The "V" and "Ω" show the operator whether voltage or resistance is being measured. Some switch positions are also required for simulation with the engine running. By pressing the buttons, when the control unit is connected and the engine is running operating conditions can be altered as desired, i.e. they can be simulated. Thus, for example, when the engine is at operating temperature, by pressing button 1 the control unit can be made to "believe" that the engine temperature is at -20°C, allowing the reaction of the control unit to be assessed at the motortester.

Where necessary, the circuit diagram can be used for trouble-shooting.



Preparation for testing with the universal test adapter

Disconnect the control-unit plug from the control unit (arrow, in engine compartment on the right as seen in direction of travel). To do this push back fuse (1).

Connect Ecotronic adapter cable to control-unit plug.

Test conditions: - Engine in good mechanical order
(valve timing, compression etc.).

- Ignition and starting systems OK.

Short-circuit jacks 1 and 2 on the universal test adapter (test lead).

Note:

Make sure that jack 1 on the universal test adapter never comes into contact with ground (e.g. black test inlet). This would destroy the control unit.

If the engine will not start, proceed with the universal test adapter up to the "start engine" instruction, and then continue with the trouble-shooting program (customer complaint).



B8

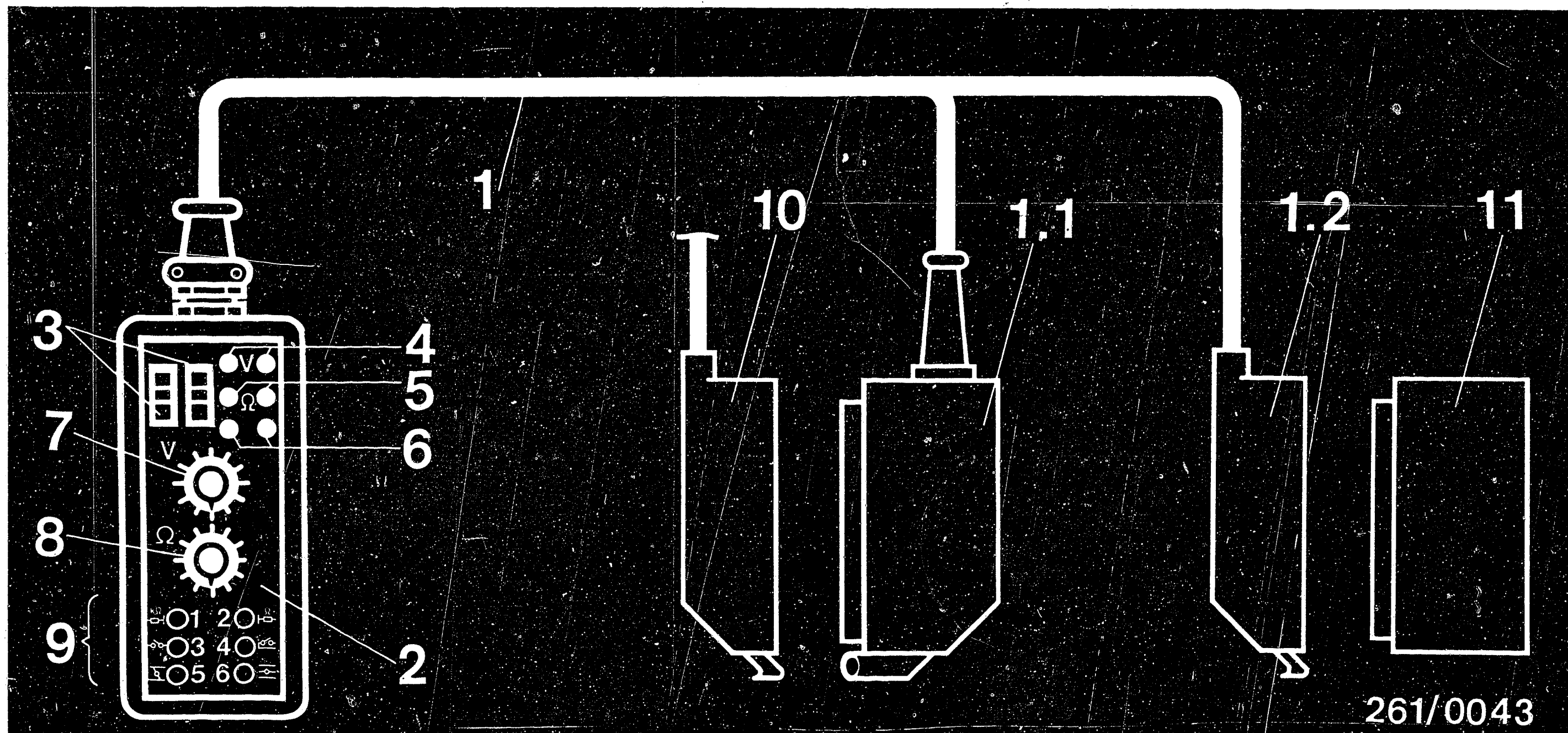
Test chart for universal test adapter
Mercedes-Benz



B9

Test chart for universal test adapter
Mercedes-Benz





261/0043

Universal test adapter with adapter cable for Ecotronic

- | | | |
|-----------------------------------|---|--|
| 1 = Adapter cable | 4 = Test jacks (for voltage measurement) | 9 = Buttons for simulation of operating conditions |
| 1.1. Connection to wiring harness | 5 = Test jacks (for resistance measurement) | Button 1 = NTC cold (-20°C) |
| 1.2. Connection to control unit | 6 = Jacks (must be bridged for Ecotronic testing) | Button 5 = NTC warm (+80°C) |
| 2 = Universal test adapter | 7 = Program switch "V" | Button 4 = Actuation of evacuating valve |
| (Part no.: 0 684 101 801) | 8 = Program switch "Ω" | 10 = Ecotronic wiring harness |
| 3 = Test inlets (for motortester) | | 11 = Control unit |

B 10

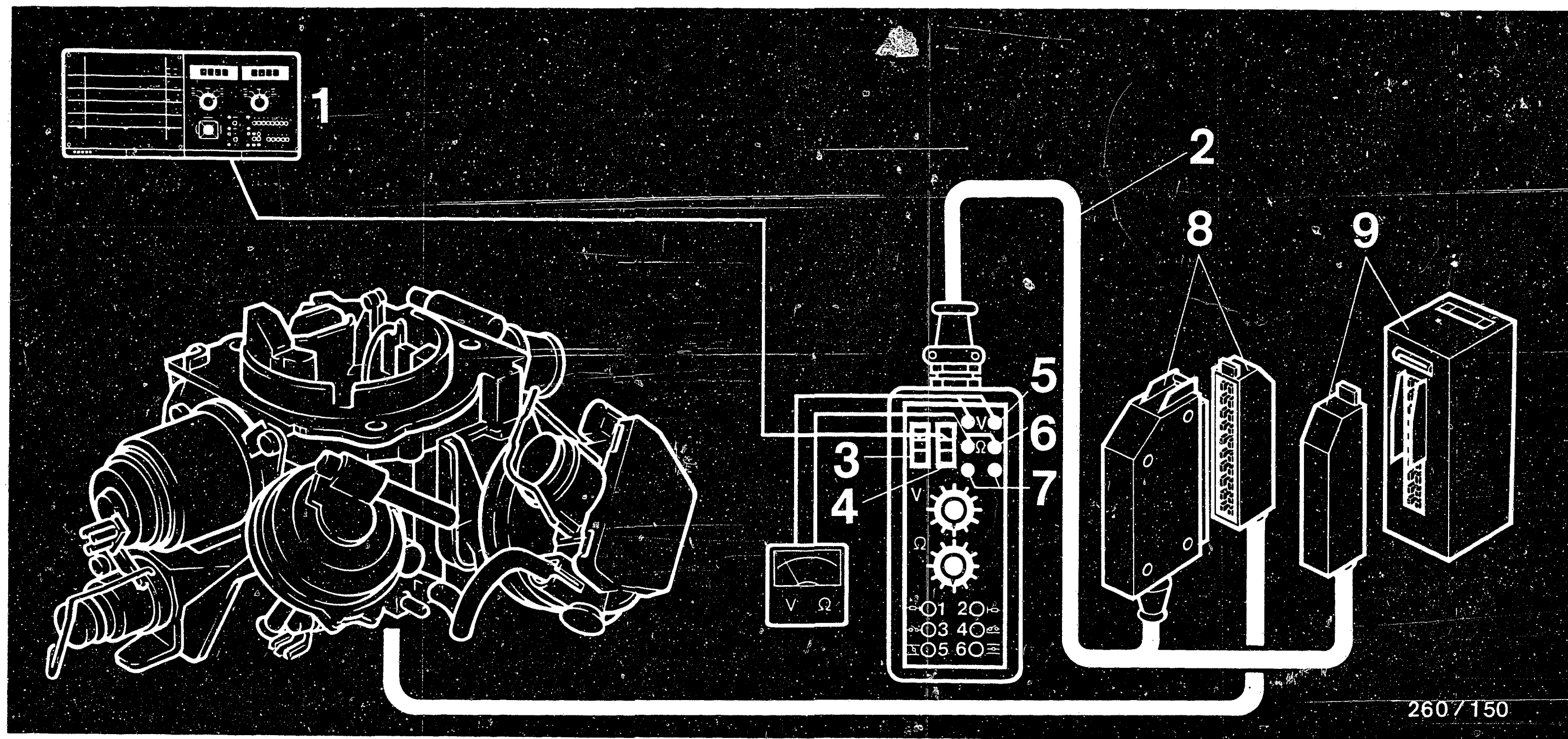
Test chart for universal test adapter
Mercedes-Benz



B 11

Test chart for universal test adapter
Mercedes-Benz





260/150

Connection of universal test adapter

- 1 = Motortester
- 2 = Adapter cable for Ecotronic
- 3 = Red connection jack (test inlet for red terminal of motortester)
- 4 = Black connection jack (test inlet) for black terminal of motortester

- 5 = Connection of voltmeter to V jacks (red = +, black = ground or negative)
- 6 = Connection of ohmmeter to Ω-jacks (blue)
- 7 = Short-circuit plug between jacks 1 and 2
- 8 = Connection to Ecotronic wiring harness
- 9 = Connection to Ecotronic control unit

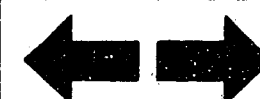
B 12

Test chart for universal test adapter
Mercedes-Benz



B 13

Test chart for universal test adapter
Mercedes-Benz



Test step 1: Switch on ignition. Disconnect control-unit plug from Ecotronic control unit. Connect jacks 1/2 on universal test adapter (upper illustration).

Operation: Position:

Program switch "V": ↓

Program switch "Ω": 1

Subject of testing:

Insulation resistance, choke-valve actuator with supply lead (terms. 12/2)

Measuring equipment:

Multimeter
(Ω-range)

Measuring range: 10 M Ω

Connection: Blue test jacks

Operation in vehicle:

Ignition switched off, control unit not connected

Test specification (reading):

> 1 M Ω

Is test specification reached?

yes

Continue testing with next test step.

Trouble-shooting:

Disconnect control-unit plug from system adapter cable.

Pull plug from choke-valve actuator.

With ohmmeter, test at control-unit plug term. 10 or 12 (middle illustration) to ground:

Reading: > 1 M Ω

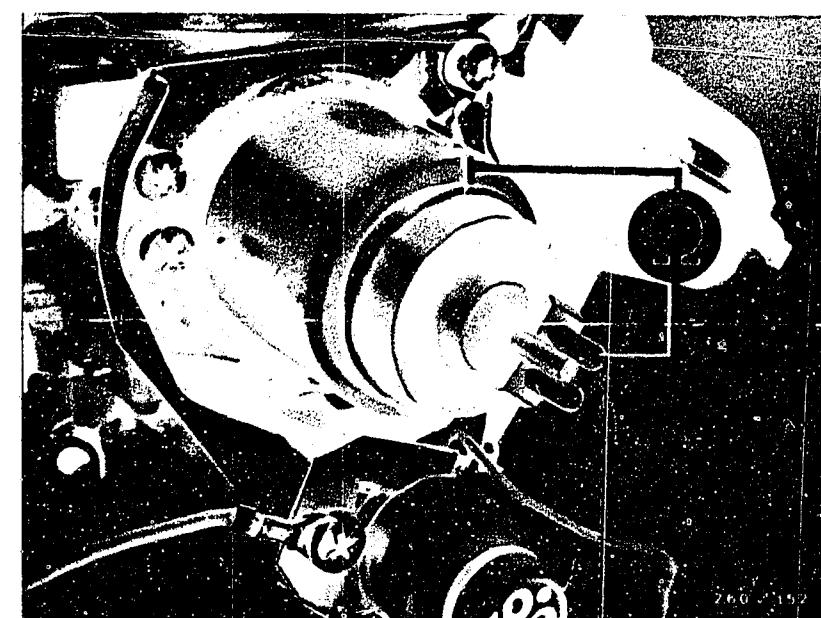
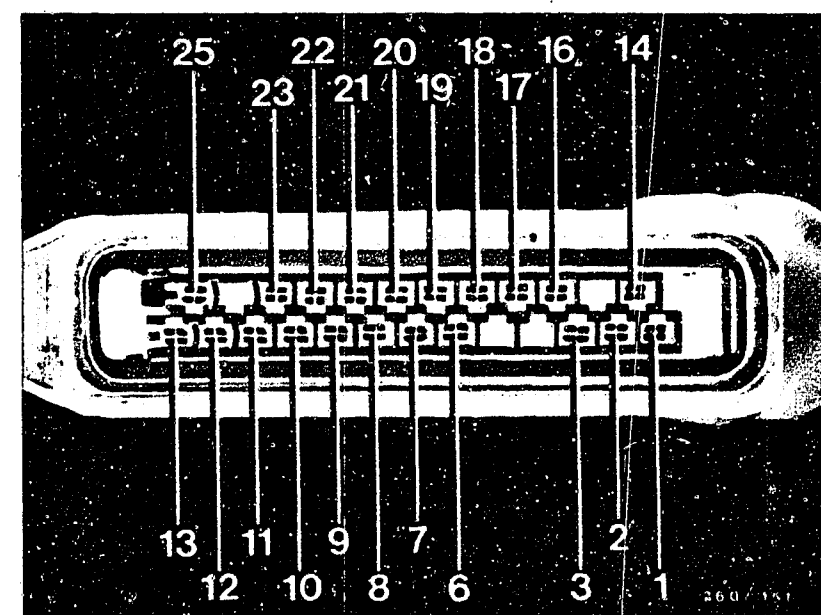
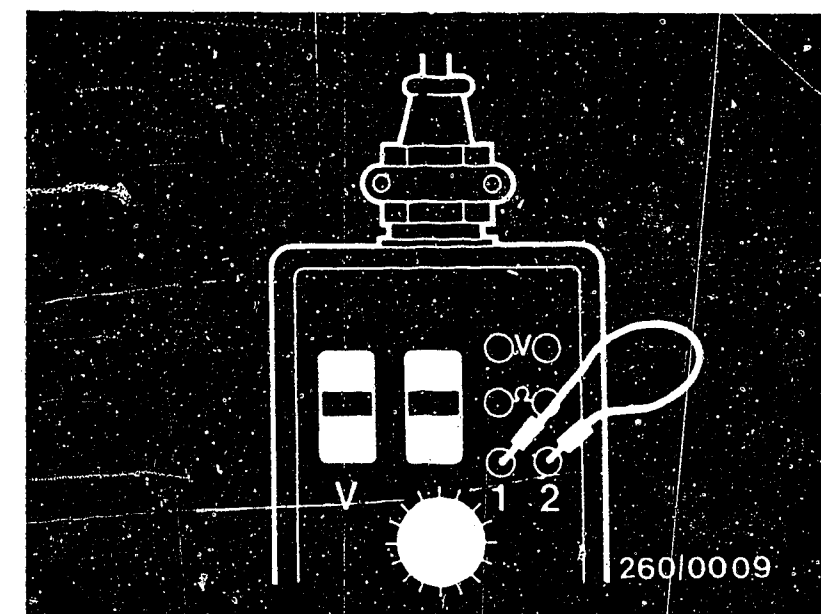
Test insulation resistance directly at the plug pins of the choke-valve actuator (lower illustration):

Reading: > 1 M Ω

Remedying defect:

Eliminate short circuits in leads.
Replace choke-valve actuator.

Continued on next page



B14

Test chart for universal test adapter
Mercedes-Benz



B15

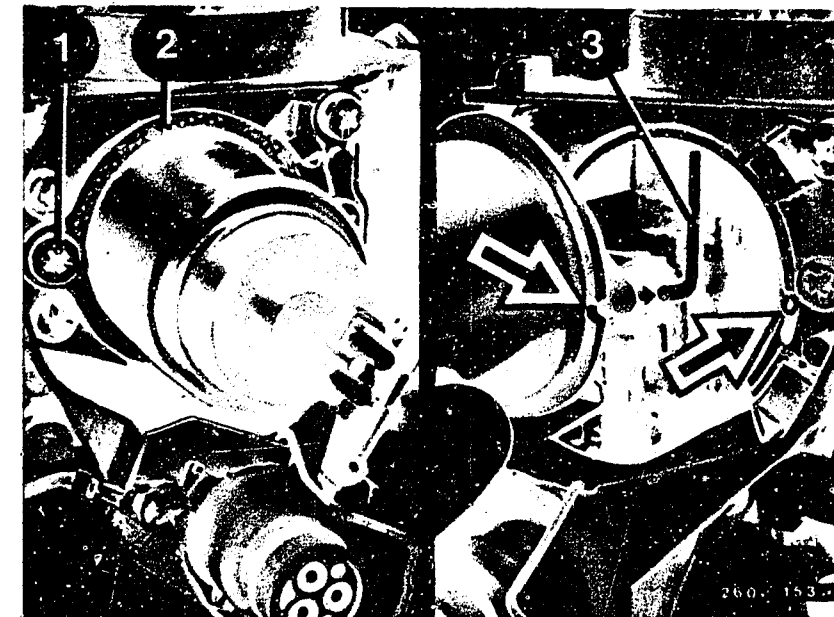
Test chart for universal test adapter
Mercedes-Benz



↓

Replacing choke-valve actuator:

- Remove air filter.
- Remove fastening screw (1) (upper illustration).
- Turn clamping ring (2) out of bracket.
Remove choke-valve actuator.
- When installing choke-valve actuator, pay attention to detent (arrows) and to the connection rod (3) to the choke-valve plate.



B16

Test chart for universal test adapter
Mercedes-Benz



B17

Test chart for universal test adapter
Mercedes-Benz



Test step 2:

Operation: Position:

Program switch "V": ↓

Program switch "Ω": 3

Subject of testing:

Resistance of choke-valve actuator
(terms. 12/10)

Measuring equipment:

Multimeter (Ω-range)

Measuring range: x Ω

Connection: Blue test jacks

Operation in vehicle:

Ignition switched off, control unit not
connected.

Test specification (reading):

< 10 M Ω

(Measurement value is influenced by
protective resistor in universal test
adapter!)

Is test specification reached?

yes

Continue testing with next test step

Trouble-shooting:

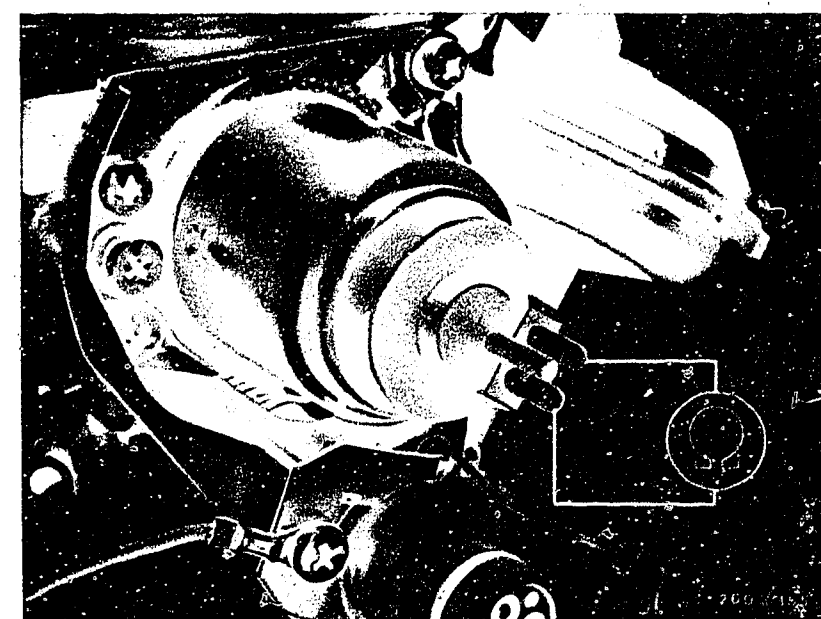
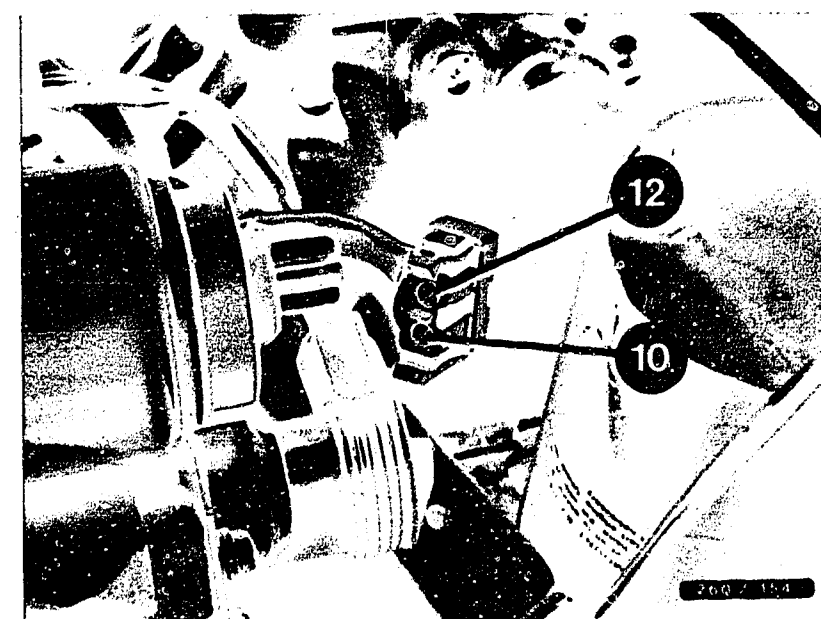
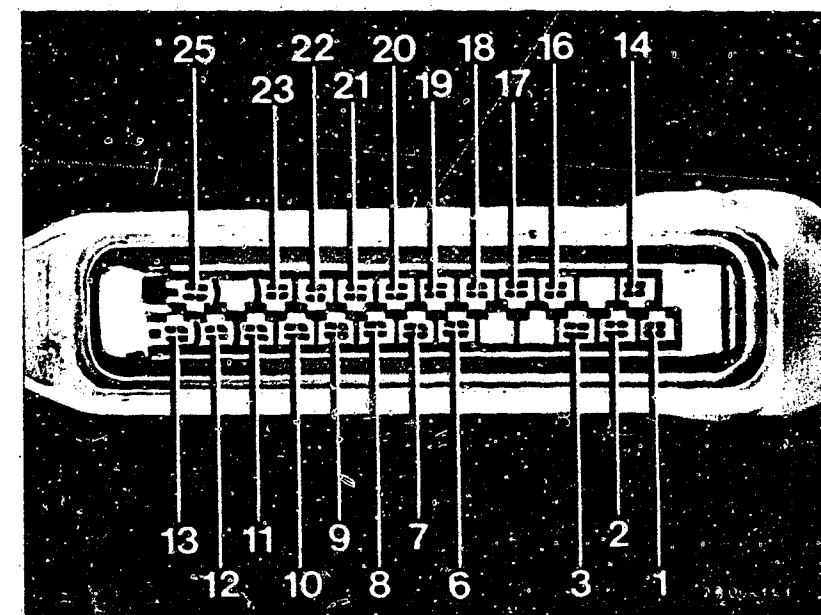
- Check plug connection:
corrosions, loose contact
- Test lead from control-unit plug
terms. 12 and 10 to plug for
choke-valve actuator (middle
illustration) for continuity
(nominal value: approx. 0 Ω)
- Spring contacts in control-unit
plug must not be able to be pushed
back.

Repeat measurement directly at
choke-valve actuator (lower
illustration).

Nominal value: 0.9...1.7 Ω.
If nominal value is not reached
replace choke-valve actuator.

no

Continued on next page



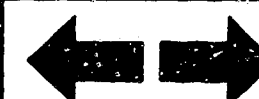
B 18

Test chart for universal test adapter
Mercedes-Benz



B 19

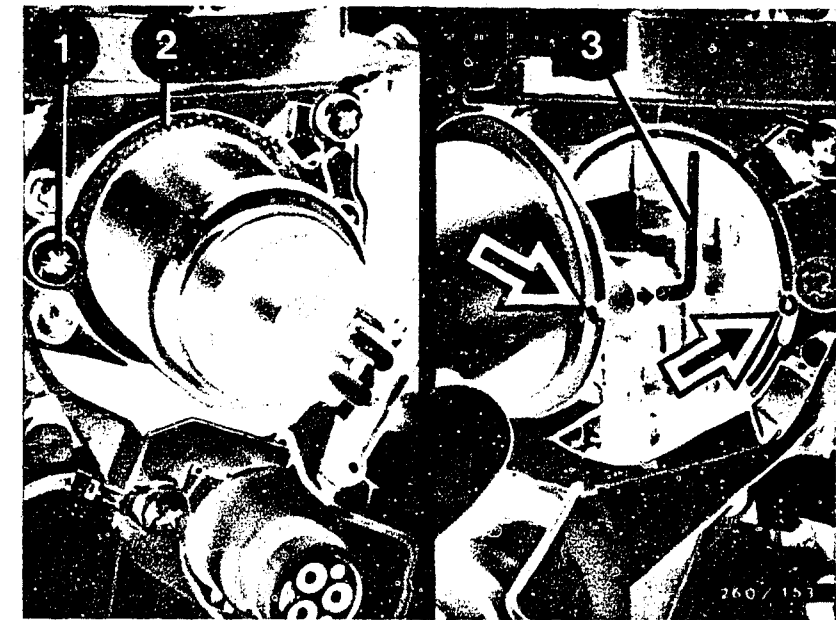
Test chart for universal test adapter
Mercedes-Benz



↓

Replacing choke-valve actuator:

- Remove air filter
- Remove fastening screw (1).
- Turn clamping ring (2) out of bracket.
Remove choke-valve actuator.
- When installing choke-valve actuator, pay attention to detent (arrows) as well as to the connection rod (3) to the choke-valve plate.



B20

Test chart for universal test adapter
Mercedes-Benz



B21

Test chart for universal test adapter
Mercedes-Benz



Test step 3:

Operation: Position

Program switch "V": 

Program switch "Ω": 5

Subject of testing:

Coolant-temperature sensor
(terms. 21/2)

Measuring equipment:

Multimeter (Ω-range)

Measuring range: 10 kΩ

Connection:

Blue test jacks

Operation in vehicle:

Ignition switched off. Control unit
not connected

Test specification (reading):

at +20°C: 2 kΩ ... 3 kΩ

at +80°C: 280 Ω ... 360 Ω

(Measured value depends on
temperature)

Is test specification reached?

yes

Continue testing with next test step

Trouble-shooting:

Using ohmmeter, test lead from
control-unit plug term. 21 to
temperature-sensor plug (middle
illustration) for short or open
circuits:

Reading: approx. 0 Ω

Check spring contacts on plug; they
must not be able to be pushed back.

Using ohmmeter, test directly
between plug pin for temperature
sensor and ground (lower
illustration).

Reading:

at +20°C: 2 kΩ... 3 kΩ

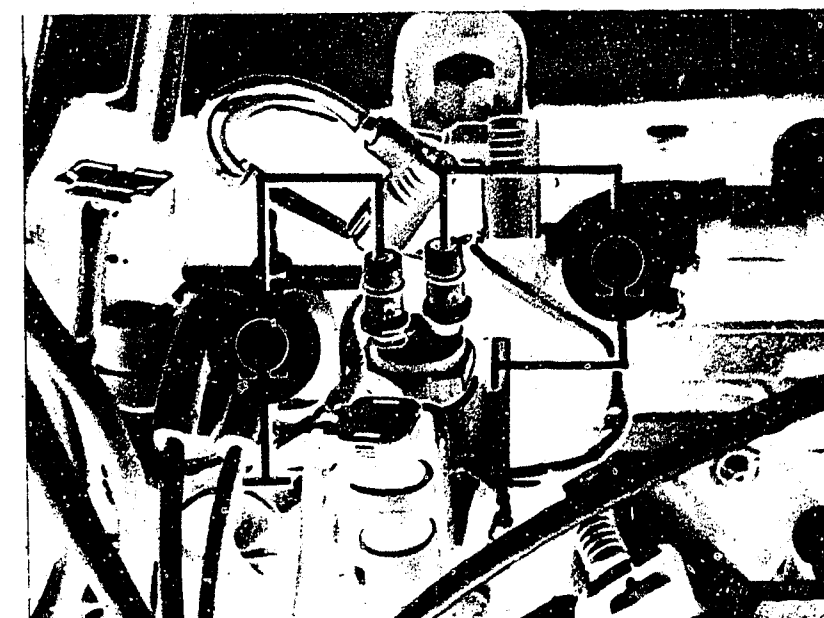
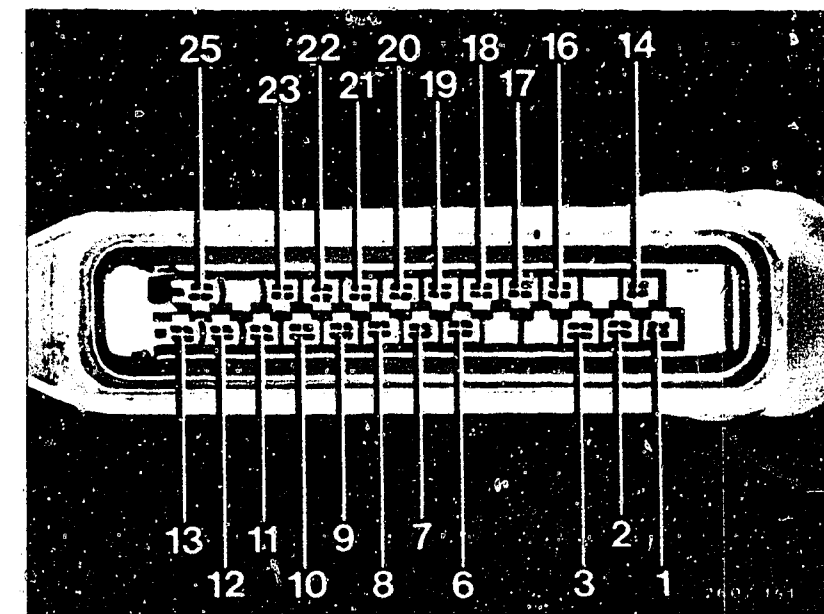
at +80°C: 280 Ω... 360 Ω

Measured value depends on
temperature:

Remedying defect:

Eliminate contact resistances, open
circuits, loose contacts, and short
circuits in leads and plug contacts.

Replace temperature sensor.



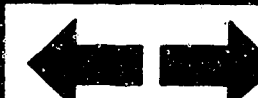
B22

Test chart for universal test adapter
Mercedes-Benz



B23

Test chart for universal test adapter
Mercedes-Benz



Test step 4:

Operation: Position:

Program switch "V": 

Program switch "Ω": 7

Subject of testing:

Resistance of ground leads
(terms. 20/2)

Measuring equipment:

Multimeter (Ω-range)

Measuring range: x Ω

Connection:

Blue test jacks

Operation in vehicle:

Ignition switched off. Control unit not connected.

Test specification (reading):

< 10 Ω

Is test specification reached?

yes

Continued in next test step

Trouble-shooting:

For testing, disconnect control-unit plug from system adapter cable. If necessary use circuit diagram.

Test plug connections:

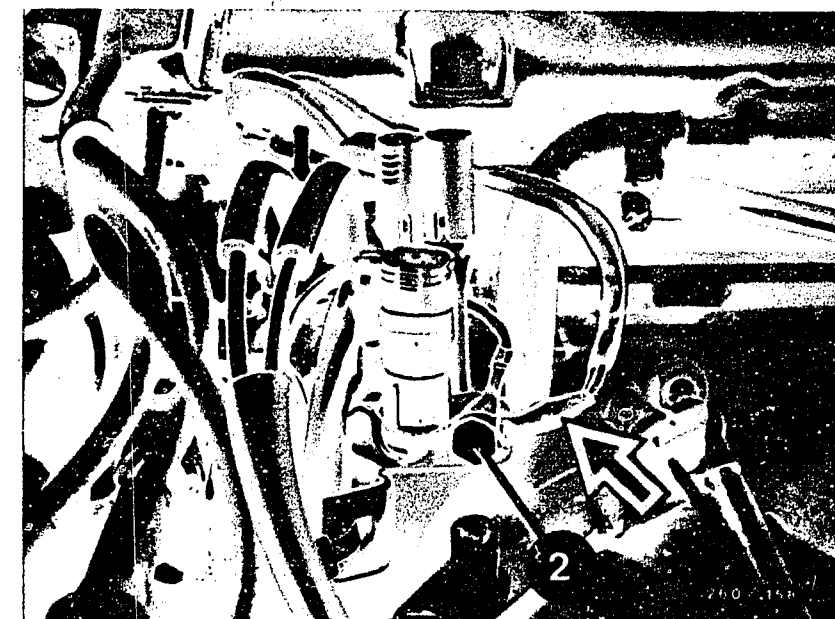
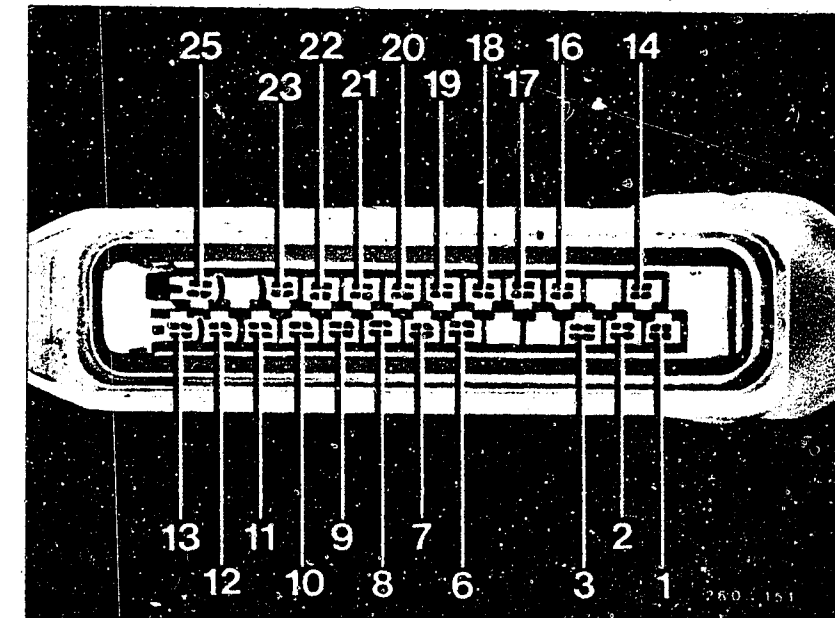
Loose contacts, corrosion, contacts must not be able to be pushed back.

Using ohmmeter, test following leads for continuity:

- no →
- From control-unit plug (upper illustration) term. 20 to vehicle ground (middle illustration)
 - From control-unit plug term. 2 to vehicle ground (lower illustration)

Reading: approx. 0 Ω

If test specification is not reached, check whether ground connection (battery negative pole, middle illustration) shows proper connection (corrosion).



C1

Test chart for universal test adapter
Mercedes-Benz



C2

Test chart for universal test adapter
Mercedes-Benz



Test step 5:

Operation:

Position:

Program switch "V" ↓

Program switch "Ω": 12

Subject of testing:

Resistance of solenoid-operated valve (evacuating) in the throttle-valve positioner (terms. 9/2)

Measuring equipment:

Multimeter (Ω-range)

Measuring range: x 100 Ω

Connection: Blue test jacks

Operation in vehicle:

Ignition switched off, control unit not connected.

Test specification (reading):

20 ... 80 Ω

(Measured value influenced by protective resistor in universal test adapter)

Is test specification reached?

yes

Continue testing with next test step

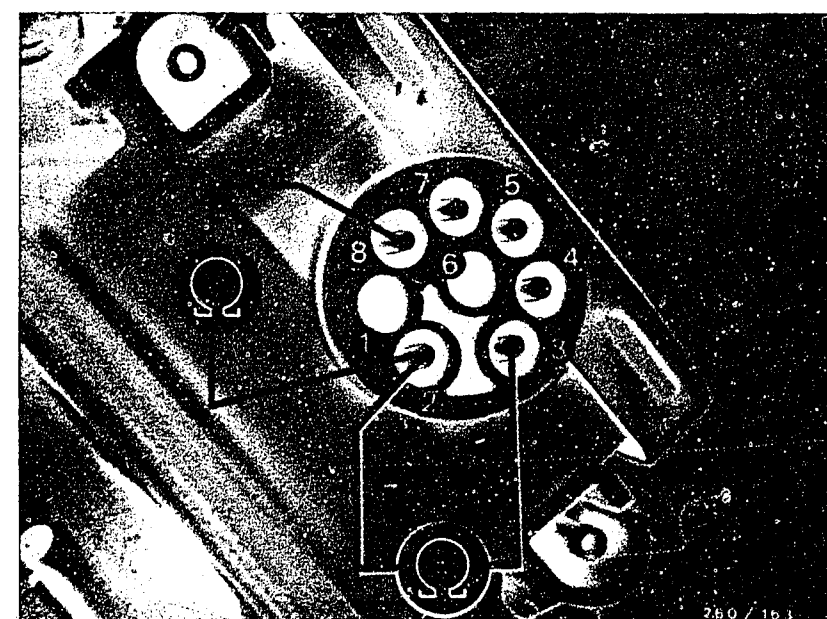
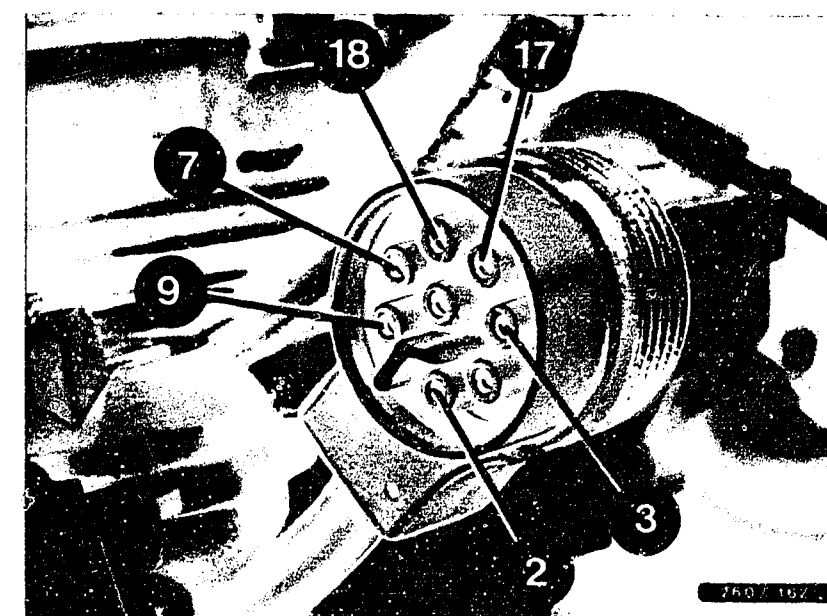
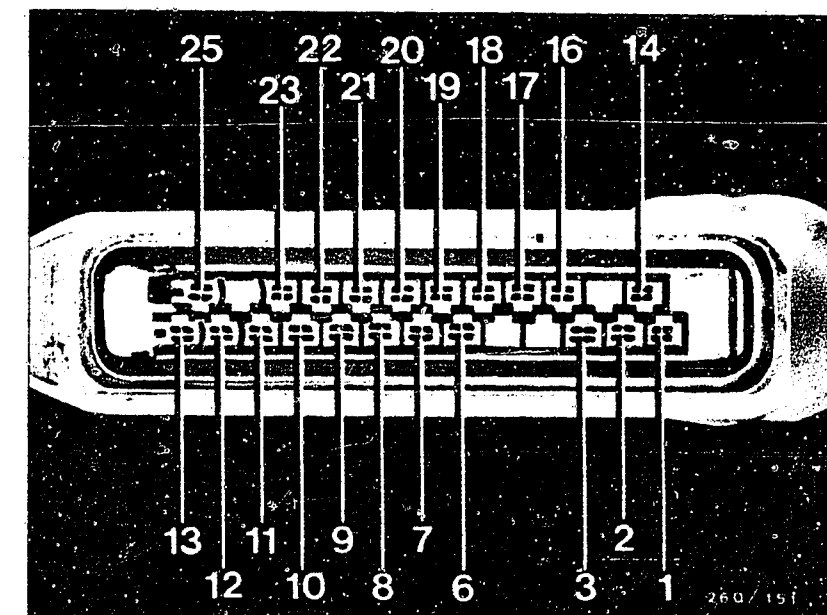
Trouble-shooting:

Disconnect control-unit plug from system adapter cable.
Pull plug from throttle-valve positioner. Using ohmmeter, test following leads for continuity and short circuits:

- From control-unit plug (upper illustration) term. 9 to plug for throttle-valve positioner, term. 9 (middle illustration)
- From control-unit plug term. 2 to plug for throttle-valve positioner, term. 2.
Reading: 0 Ω
- Control-unit plug (upper illustration) term. 9 to term. 2.
Reading: > M Ω
(Plug for throttle-valve positioner disconnected)

Check plug connections: corrosion, loose contacts (spring contacts must not be able to be pushed back).
Using ohmmeter, test directly at plug pins of throttle-valve positioner (lower illustration), term. 3 to term. 2:
Reading: 20...70 Ω

Continued on next page



C3

Test chart for universal test adapter
Mercedes-Benz



C4

Test chart for universal test adapter
Mercedes-Benz



Continuation of trouble-shooting, test step 5

Remedying defect:

Eliminate short circuits, contact resistances, open circuits, and loose contacts in leads.

Replacing throttle-valve positioner:

Disconnect all plugs from carburetor. Remove carburetor. Unscrew fastening nuts (upper illustration, 1) and take out throttle-valve positioner.

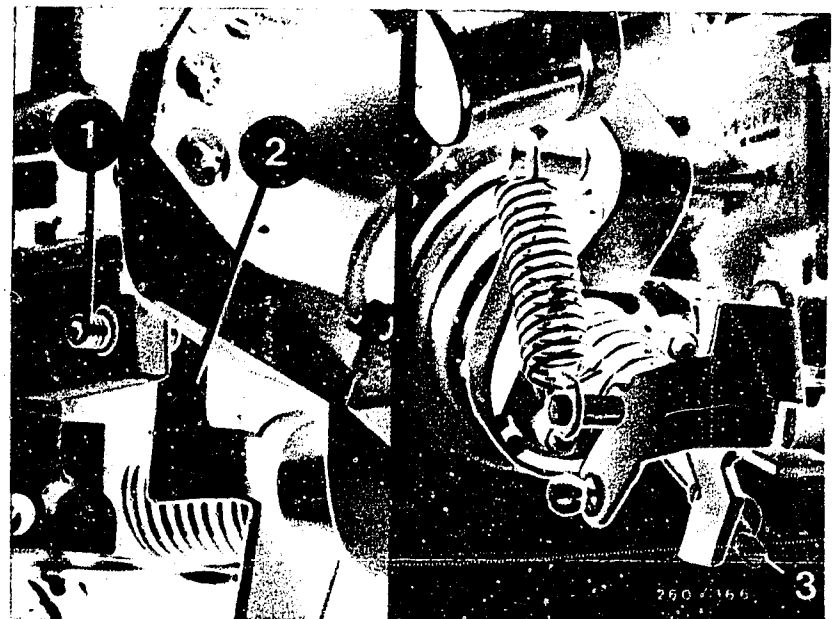
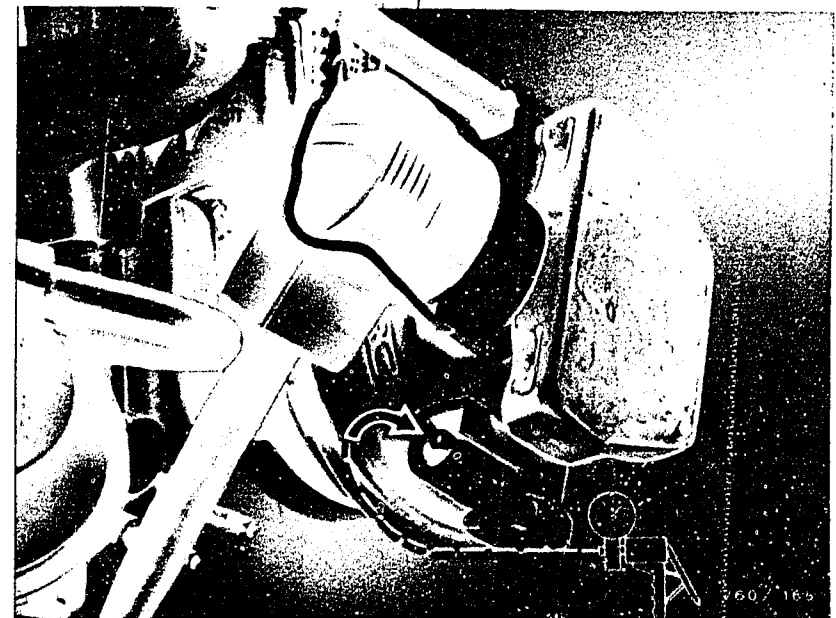
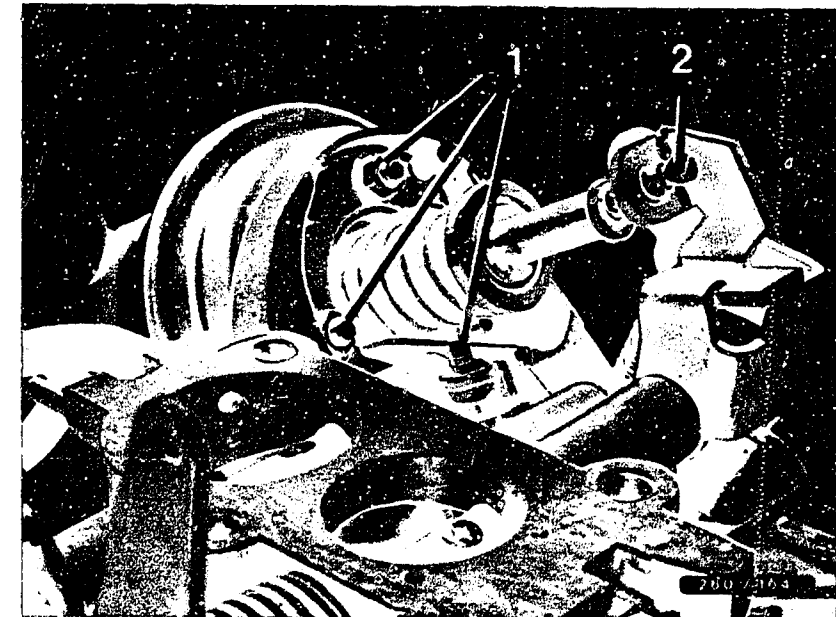
Replace idle stop screw (upper illustration, 2).

Install new throttle-valve positioner and replace carburetor. Re-connect all plugs on carburetor.

Adjusting throttle-valve positioner:

Connect Y-lead to control unit.
Switch on ignition.
Connect vacuum pump to evacuating valve (lower illustration) and generate a continuous pressure differential (approx. 250 mbar) during the adjustment process (tappet of throttle-valve positioner moves into position thus determined).

Continued on next page



C5

Test chart for universal test adapter
Mercedes-Benz



C6

Test chart for universal test adapter
Mercedes-Benz



Continuation of trouble-shooting, test step 5

In this position the feeler gauge (2.0 ± 0.05 mm) should easily slide between the throttle-valve stop screw and stop (1 and 2).

Note: The throttle-valve stop screw (1) must not be moved.

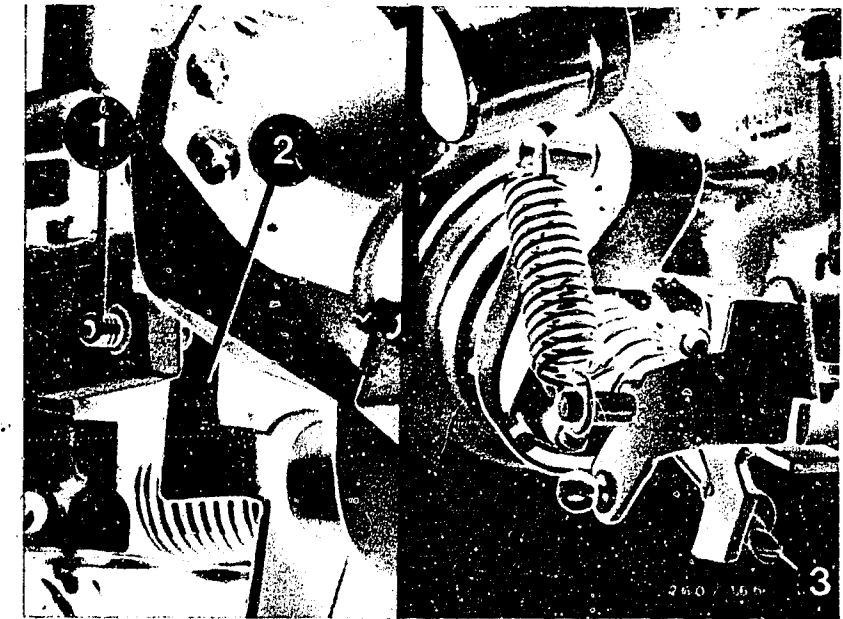
Set at idle stop screw (3).

Break off head of idle stop screw.

Restore hose connection.
Test idle.

Switch off ignition.

Remove Y-adapter cable from control unit.



C7

Test chart for universal test adapter
Mercedes-Benz




C8

Test chart for universal test adapter
Mercedes-Benz



Test step 6:

Operation: Position:

Program switch "V": 
Program switch "Ω": 13

Subject of testing:

Resistance of solenoid-operated valve (ventilating) in throttle-valve positioner (terms. 3/2)

Measuring equipment:

Multimeter
(Ω-range)

Measuring range: x 100 Ω

Connection: Blue test jacks

Operation in vehicle:

Ignition switched off, control unit not connected.

Test specifications (reading):
20 ... 80 Ω

(Measured value is influenced by protective resistor in universal test adapter)

Is test specification reached?

yes

Continue testing with next test step

Trouble-shooting:

Remove control-unit plug from system adapter cable.
Pull plug from throttle-valve positioner.

Using ohmmeter, test following leads for continuity and short circuits:

- From control-unit plug (upper illustration) term. 3 to plug for throttle-valve positioner, term. 3 (middle illustration)

Reading: approx. 0 Ω

- At control-unit plug (upper illustration) term. 3 to term. 2

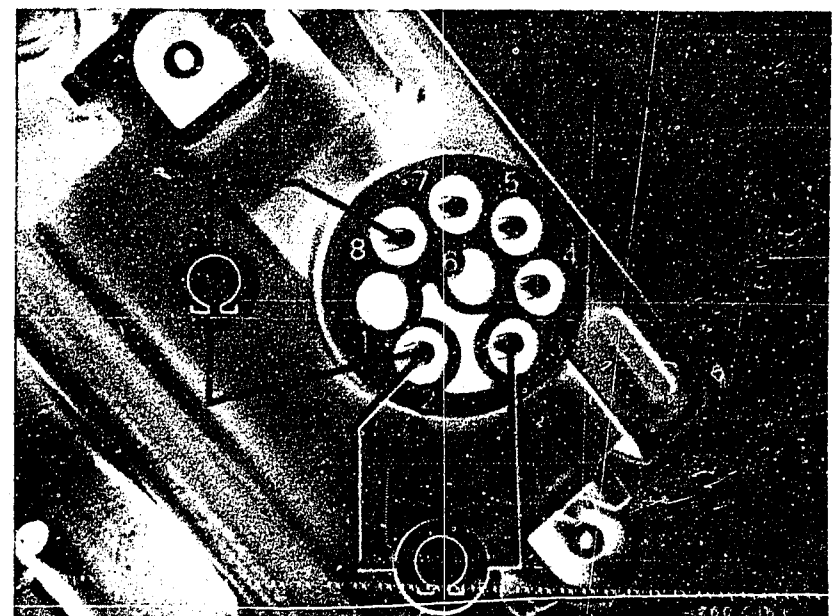
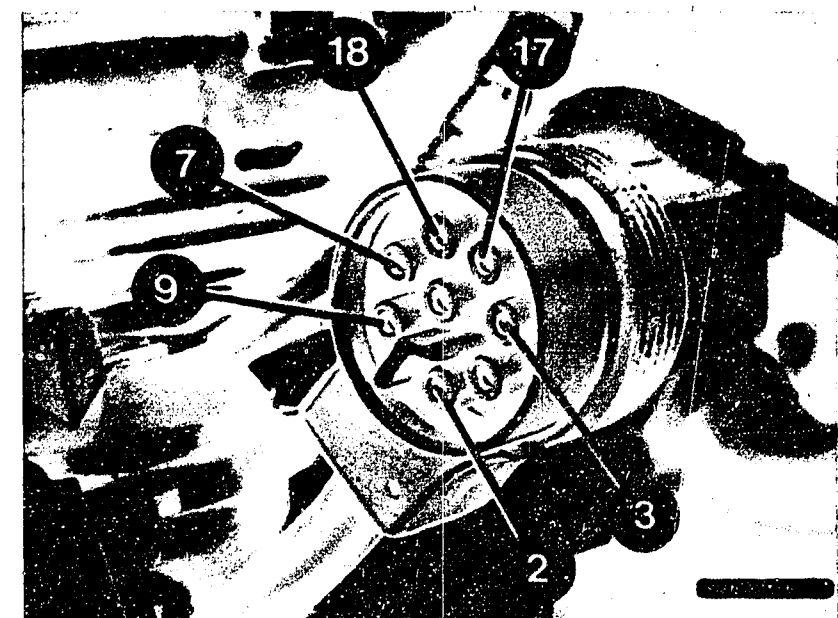
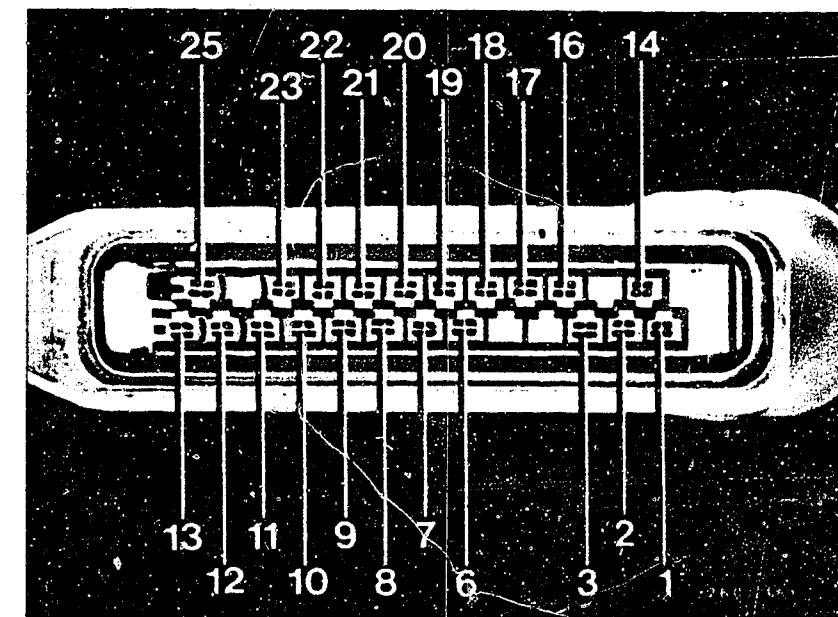
Reading: > 1 M Ω
(Throttle-valve-positioner plug pulled)

Check plug connection:

Corrosion, loose contacts (spring contacts must not be able to be pushed back). Using ohmmeter, test directly at the plug pins of the throttle-valve positioner (lower illustration), term. 8 to term. 2:

Reading: 20 ... 70 Ω

Continued on next page



C9

Test chart for universal test adapter
Mercedes-Benz



C10

Test chart for universal test adapter
Mercedes-Benz



Remedying defect:

Eliminate short circuits, contact resistances, open circuits and loose contacts in leads.

Replace throttle-valve positioner:

Pull all plugs from carburetor. Remove carburetor. Unscrew fastening nuts (upper illustration, 1) and take out throttle-valve switch.

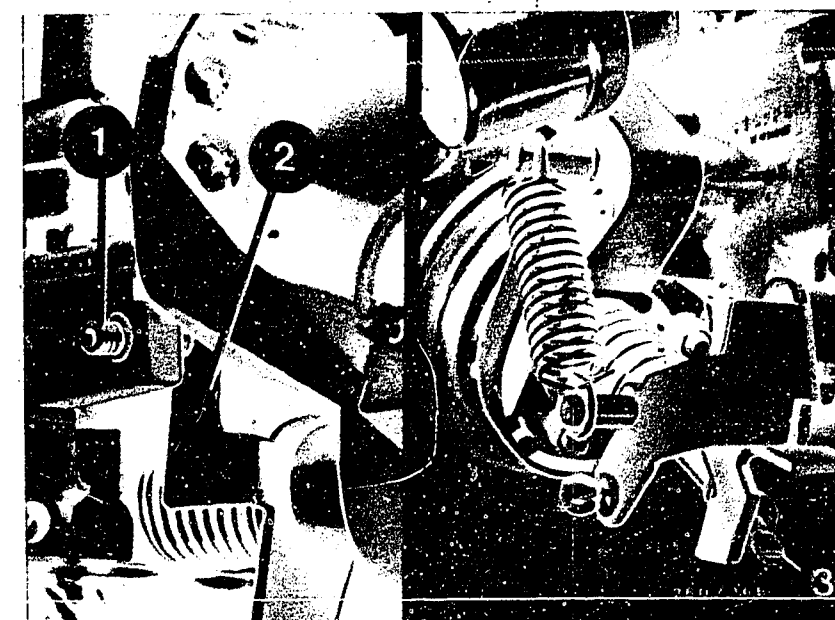
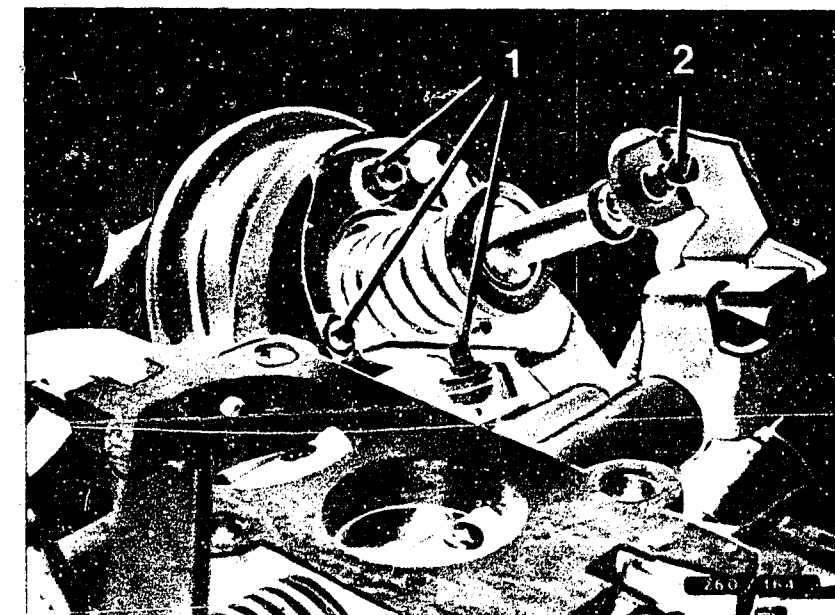
Replace idle stop screw (2) (upper illustration). Install new throttle-valve positioner and replace carburetor. Connect all plugs to carburetor.

Adjusting throttle-valve positioner:

Connect Y-lead to control unit. Switch on ignition.

Connect vacuum pump to evacuating valve (lower illustration) and generate a continuous pressure differential (approx. 250 mbar) during the adjustment process (the tappet of the throttle-valve positioner moves into the position thus determined).

Continued on next page



Continuation of C 11

In this position the feeler gauge (2.2 ± 0.05 mm) should slide between the throttle-valve stop screw and the stop (1 and 2, lower illustration).

Note: Throttle-valve stop screw must not be moved.

Adjust at idle stop screw (upper illustration, 3).

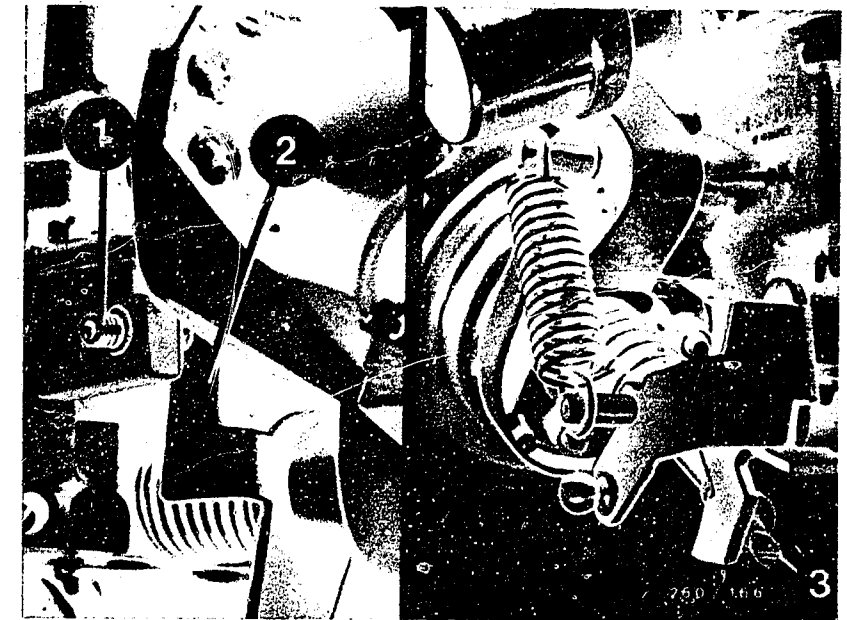
Break off the head of the idle stop screw.

Restore hose connection.

Test idle.

Switch off ignition.

Remove Y-adapter lead from control unit.



C13

Test chart for universal test adapter
Mercedes-Benz




C14

Test chart for universal test adapter
Mercedes-Benz



Test step 7: (Only on model W 201 (190) with manual transmission)

Operation: Position:

Program switch "V" 
Program switch "Ω" 15

Subject of testing:
Gear recognition
(terms. 16/2)

Measuring equipment:
Multimeter (Ω-range)

Measuring range: x Ω

Connection: Blue test jacks

Operation in vehicle:
Ignition switched off, control unit not
connected

Test specifications (reading): approx. 0 Ω

Is test specification reached?

yes

Continued in next test step

Trouble-shooting:

Disconnect control-unit plug from
system adapter cable.
If necessary use circuit diagram
during testing.

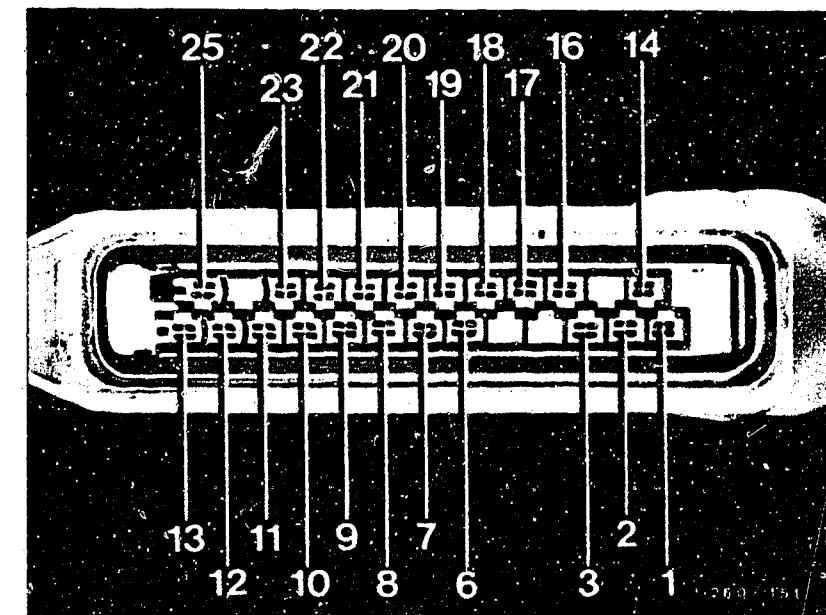
Use ohmmeter to test lead from
control-unit plug term. 16 to ground:

Reading: approx. 0 Ω

Remedying defects:

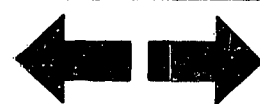
Eliminate contact resistances, open
circuits, and short circuits.

If necessary use circuit diagram.



C15

Test chart for universal test adapter
Mercedes-Benz



C16

Test chart for universal test adapter
Mercedes-Benz



Test step 8:

Operation: Position:

Program switch "V": ↓

Program switch "Ω": 20

Subject of testing:

Potentiometer in throttle-valve positioner
and at throttle plate (terms. 18/7)

Measuring equipment:

Multimeter (Ω-range)

Measuring range: 2 kΩ

Connection: Blue test jacks

Operation in vehicle:

Ignition switched off,
control unit not connected

Test specification (reading):

0.7 ... 1.3 kΩ

(Measured value is influenced by protective
resistor in universal test adapter).

Is test specification reached?

yes

Continued in next test step

Trouble-shooting:

Disconnect control-unit plug from
system adapter cable.
Pull plug from throttle-valve
positioner and throttle-plate
potentiometer.

Using ohmmeter, test following leads
for short and open circuits:

- From control-unit plug (upper
illustration) term. 18 to throttle-
valve positioner (middle
illustration) term. 18 and to plug
for throttle-plate potentiometer
(lower illustration) term. 18
- From control-unit plug term. 7 to
plug for throttle-valve
positioner, term. 7 and to plug
for throttle-plate potentiometer,
term. 7.

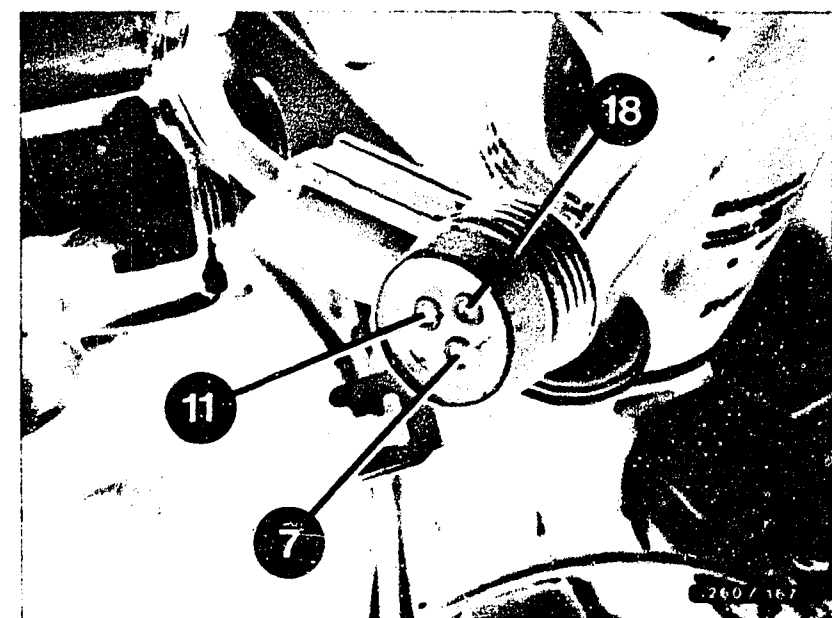
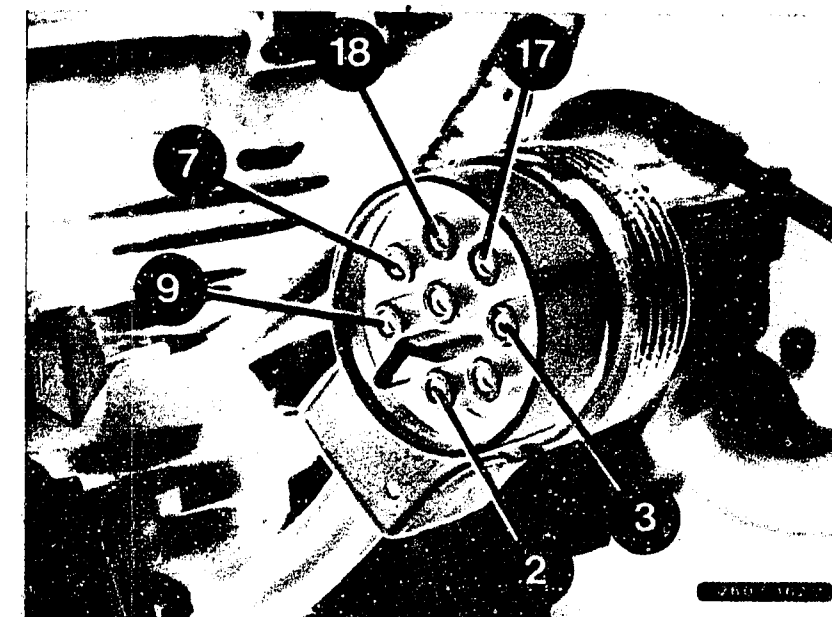
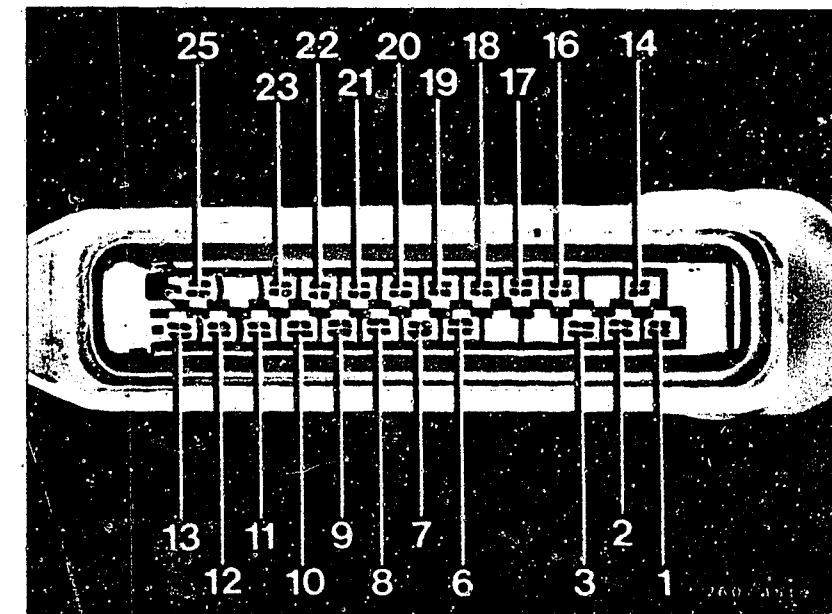
Reading: 0 Ω

- At control-unit plug, term. 18 to
term. 7

Reading: > 1 M Ω

(Plugs for throttle-valve positioner
and throttle-plate potentiometer
pulled)

Continued on next page



C17

Test chart for universal test adapter
Mercedes-Benz



C18

Test chart for universal test adapter
Mercedes-Benz



Trouble-shooting, test step 8 (continued)

Test resistance of throttle-plate potentiometer (upper illustration)

Nominal value 1.4 ... 2.6 k Ω

If nominal value is not reached replace throttle-valve potentiometer.

When removing the potentiometer, be careful of coupling (middle illustration - 1); it can fall out.

When inserting, make sure of correct seating of coupling (middle illustration - 1) and detent slot (middle illustration - 2).

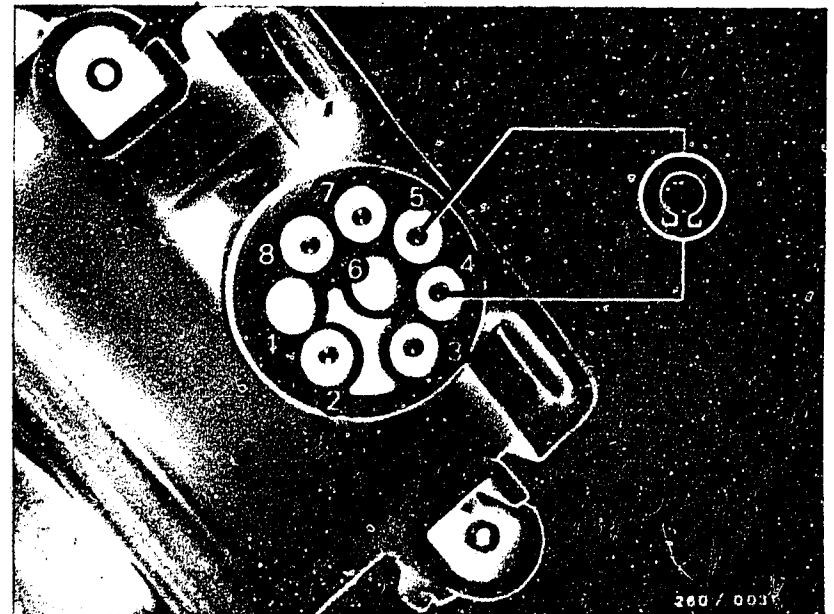
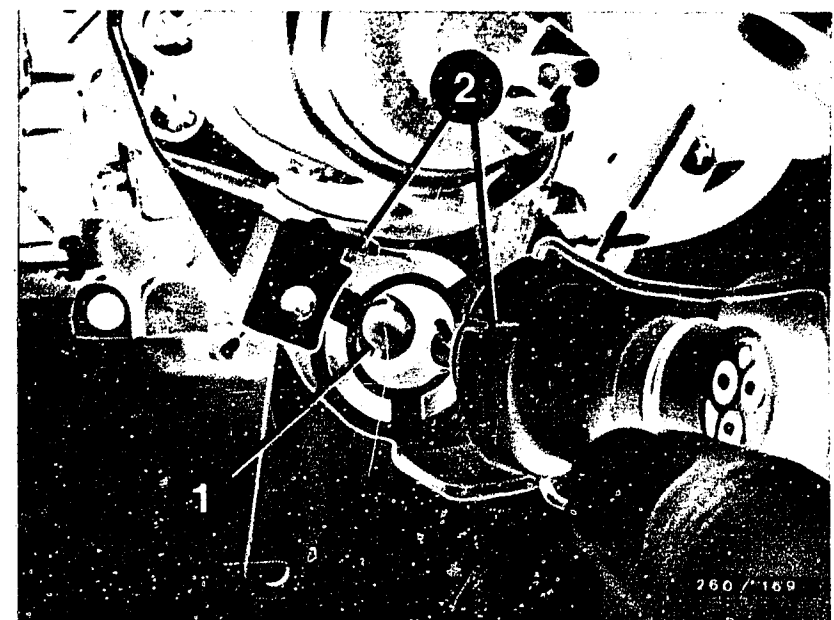
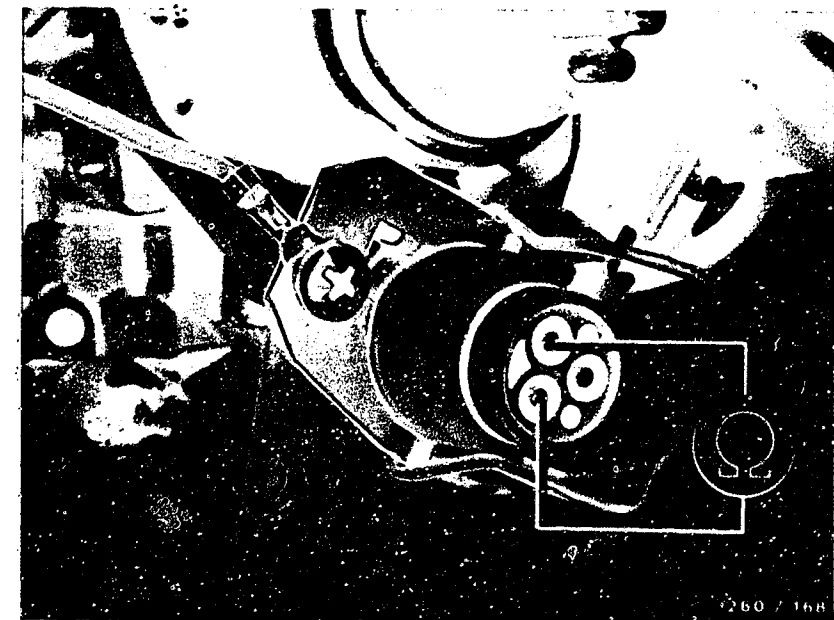
Test resistance of potentiometer in throttle-valve positioner (lower illustration)

Nominal value 1.4 ... 2.6 k Ω

Measure resistance at connections 4 and 5 (corresponds to terms. 7 and 18)

If nominal value is not reached replace the complete throttle-valve positioner.

Continued on next page.



Trouble-shooting, test step 8 (continued)

Replacing throttle-valve positioner:

Pull all plugs from carburetor. Remove carburetor. Unscrew fastening nuts (upper illustration, 1) and take out throttle-valve positioner.

Replace idle stop screw (upper illustration, 2).

Install new throttle-valve positioner and replace carburetor. Connect all plugs to carburetor.

Adjust throttle-valve positioner:

Connect Y-lead to control unit.

Switch on ignition.

Connect vacuum pump to evacuating valve (middle illustration), and generate a continuous pressure differential (approx. 250 mbar) during the adjustment process (tappet of throttle-valve positioner moves to position thus determined).

In this position, the feeler gauge (2.0 ± 0.05 mm) should slide easily between the throttle-valve stop screw and the stop (1 and 2, lower illustration).

Note: Throttle-valve stop screw must not be moved.

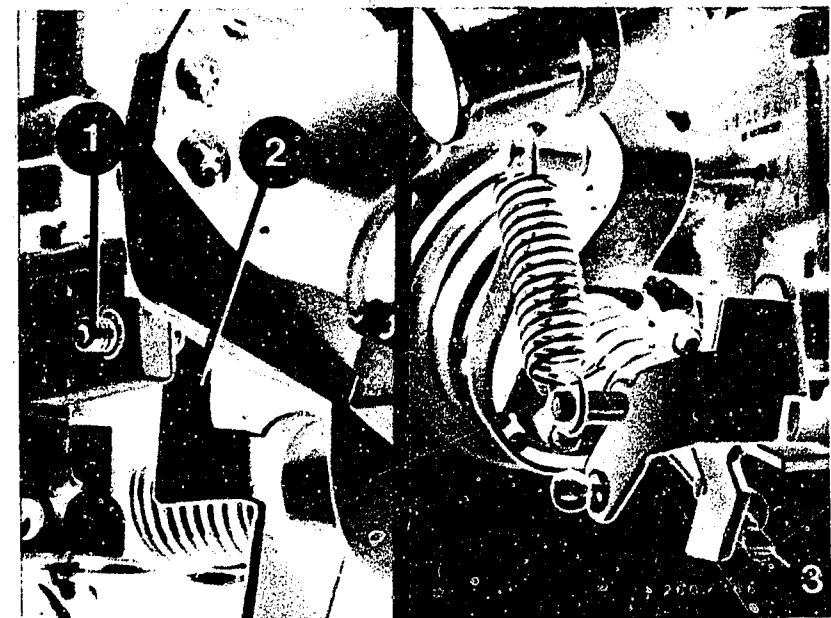
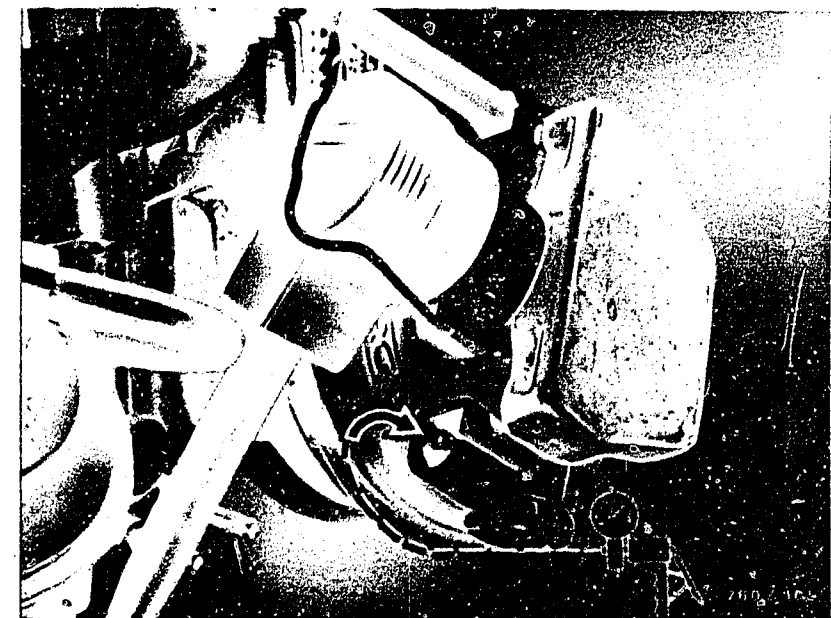
Adjust at idle stop screw (lower illustration, 3).
Break off head of idle stop screw.

Restore hose connections.

Test idle.

Switch off ignition.

Remove Y-adapter cable from control unit.



Test step 9:

Operation: Position:

Program switch "V": ↓

Program switch "Ω": 21

Subject of testing:

Adjustment plug for electronic control unit (terms. 22/7)

Measuring equipment:

Multimeter
(Ω-range)

Measuring range: 20 kΩ

Connection: Blue test jacks

Operation in vehicle:

Ignition switched off, control unit not connected.

Test specification (reading):

ECE adjustment plug:
50...600 Ω

KAT adjustment plug:
950 Ω ... 11.4 kΩ
(depending on adjustment-plug position)

Is test specification reached?

yes

Continued in next test step

Trouble-shooting:

Disconnect control-unit plug from system adapter cable.

Pull adjustment plug out of plug base.

Note: Adjustment plug is lead-sealed and must be re-sealed after testing.

Using ohmmeter, test following leads for open and short circuits:

- From control-unit plug term. 7 (upper illustration) to plug base of adjustment plug (lower illustration), term. 7

- From control-unit plug term. 22 to adjustment-plug term. 22

Reading: approx. 0 Ω

- At control-unit plug term. 22 to term. 7

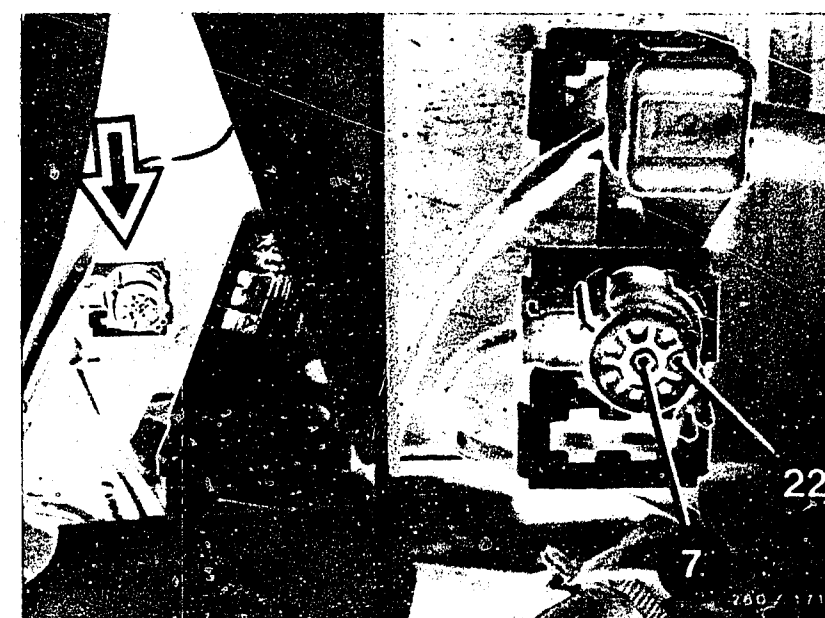
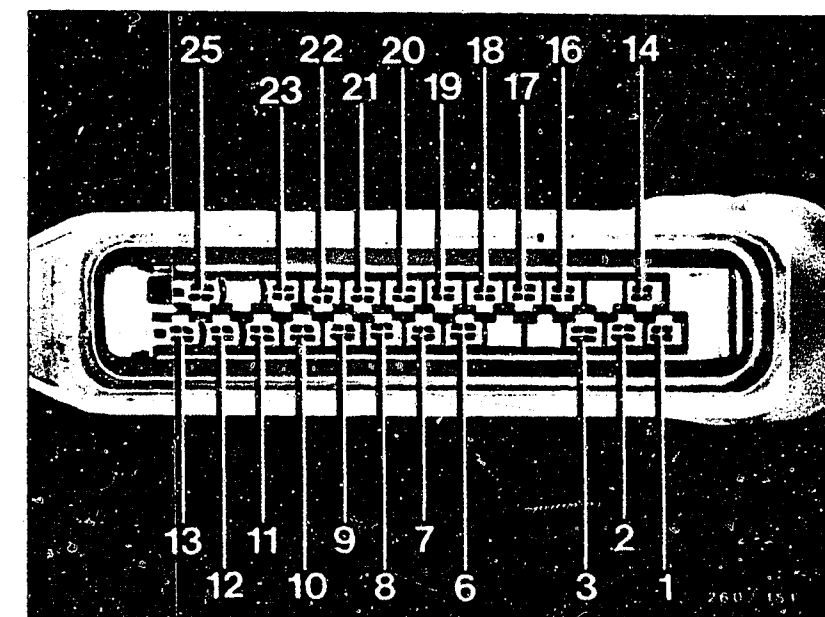
Reading: > 1 M Ω

(Adjustment plug pulled)

Using ohmmeter, measure directly between the pins of the adjustment plug:

Reading:	KAT-	ECE-plug
Position 1:	1.27 kΩ	106 Ω
Position 2:	1.6 kΩ	169 Ω
Position 3:	2.27 kΩ	249 Ω
Position 4:	3.3 kΩ	349 Ω
Position 5:	5.37 kΩ	442 Ω
Position 6:	11.4 kΩ	587 Ω
Position 7:	954 Ω	52 Ω

Continued on next page



D1

Test chart for universal test adapter
Mercedes-Benz



D2

Test chart for universal test adapter
Mercedes-Benz

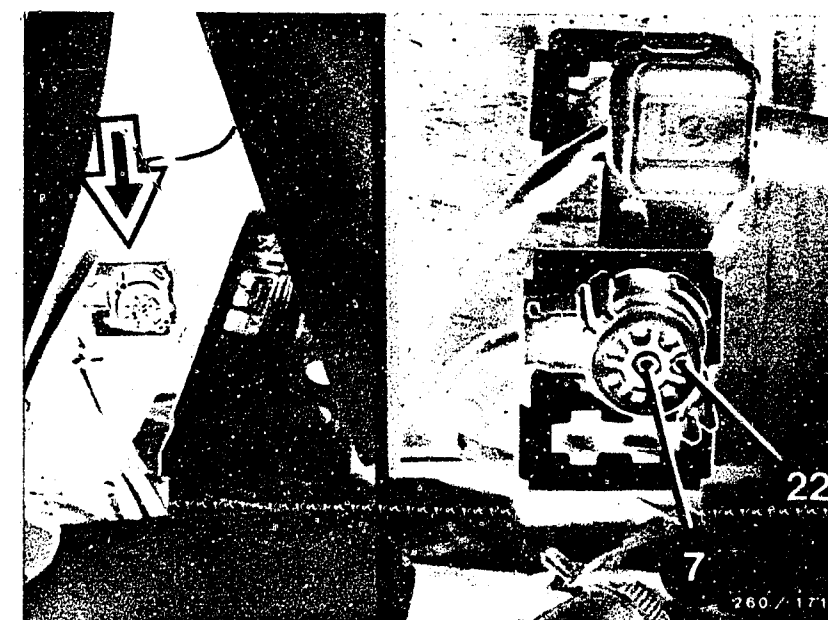


Trouble-shooting, test step 9 (continued):

Functions which can be selected with adjustment plug (normally always set to basic setting)

Plug		Position	Function	Complaint
KAT	ECE			
x		1	Basic setting for operation with unleaded premium fuel	-
		2	Basic setting for operation with unleaded regular fuel	
	x	1	Basic setting	High fuel consumption
		2	Leaning of total characteristic map	
x	x	3 - 6	Enrichment of dynamic characteristic map	
x	x	3	Enrichment at engine speeds < 2000/min and coolant temperatures < 18°C	Poor throttle response at engine speeds < 2000/min and coolant temperatures < 18°C
		4	Enrichment over total engine-speed range and coolant temperatures < 18°C	Poor throttle response in entire engine-speed range at coolant temperatures < 18°C
		5	Enrichment at engine speeds < 2000/min over entire temperature range	Poor throttle response at engine speeds < 2000/min over whole coolant-temperature range
		6	Enrichment in entire dynamic characteristic map	Poor throttle response 2nd stage in entire temperature range.
x	x	7	Idle-speed increase by 100/min	Idle speed too low

Note: Change the position of the adjustment plug only when the specified complaints have been made and no defect has been found in the system.
After re-plugging the adjustment plug re-seal with lead!



D3

Test chart for universal test adapter
Mercedes-Benz



D4

Test chart for universal test adapter
Mercedes-Benz



Test step 10:

Operation:

Position:

Program switch "V": 3

Program switch "Ω": 21

Subject of testing:

Voltage supply, Ecotronic control unit
(terms. 1/2)

Measuring equipment:

Multimeter (V-range)

Measuring range: 15 V

Connection: Test jacks
(red = +, black = -)

Operation in vehicle:

Connect control unit.
Switch on ignition.

Test specification (reading): > 10 V

Is test specification reached?

yes

Continued in next test step

Trouble-shooting:

Switch off ignition.

After 20 seconds disconnect
control-unit plug from system
adapter cable.

Test spring contacts in control-unit
plug (corrosion, loose contacts).
The spring contacts must not be able
to be pushed back.

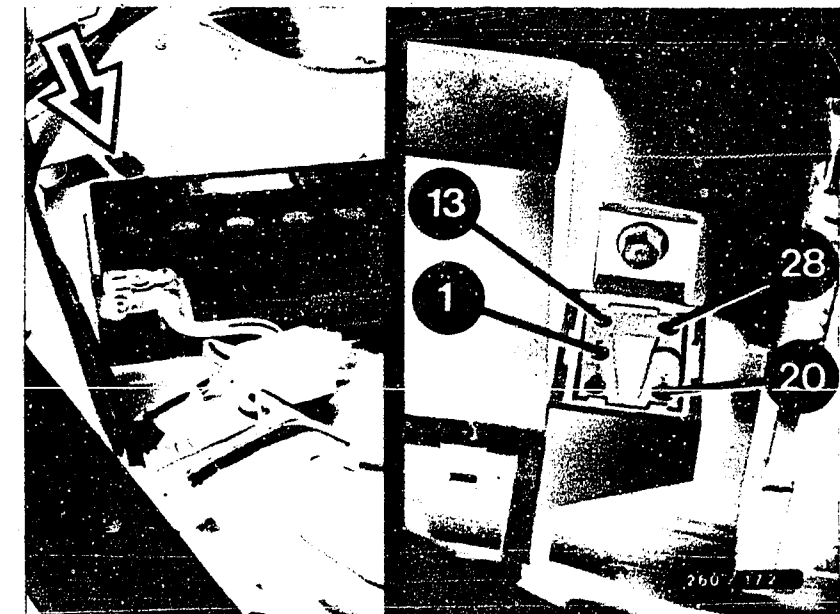
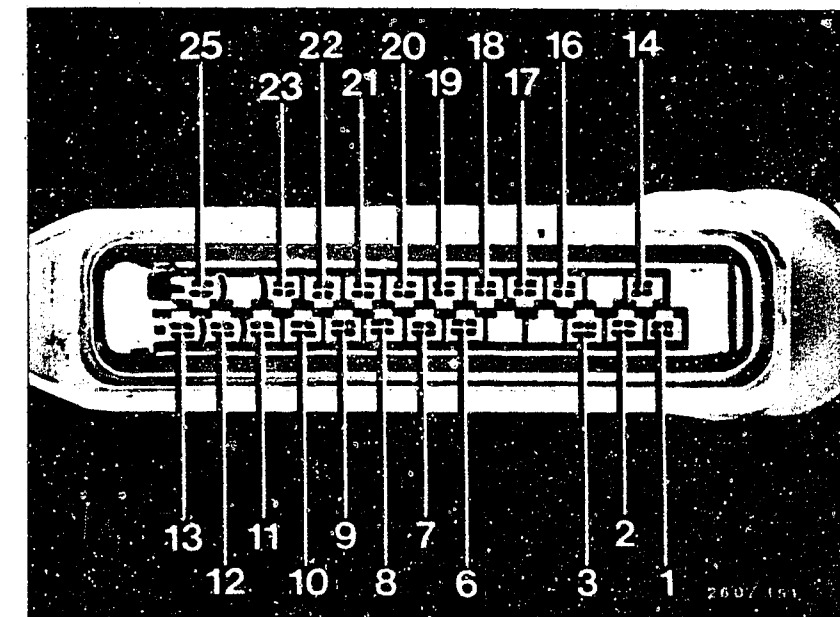
Using ohmmeter, test lead from
control-unit plug (upper
illustration) term. 1 to plug base
for over-voltage protection relay
(lower illustration) term. 1 for
short and open circuits.
Check plug base for over-voltage
protection relay (corrosion, loose
contacts).

Using voltmeter, test from
over-voltage protection relay plug
base term. 28 to ground:

Reading: > 10 V

Remedying defects:

Eliminate contact resistances, open
circuits, and short circuits in
leads.



D5

Test chart for universal test adapter
Mercedes-Benz



D6

Test chart for universal test adapter
Mercedes-Benz



Test step 11: Note: The following test steps can be undertaken only when the engine is running. If the engine will not run, proceed per the trouble-shooting chart (B3...B6).

Operation: **Position:**

Program switch "V": 5

Program switch "Ω" 21

Subject of testing:

Engine-speed signal (terms. 25/2)

Measuring equipment: Oscilloscope (motortester)

Measuring range: Special input

Connection: Test inlets (red clip at red test inlet, black clip at black test inlet)

Operation in vehicle:

Start engine

Test specification (reading):

See upper illustration

Is test specification reached?

no

Trouble-shooting:

- Engine fails to start, but engine-speed signal is present.
Visual check: If the tappet of the throttle-valve positioner moves during the starting procedure, replace the Ecotronic control unit.

- Switch off ignition. Wait at least 20 seconds, then disconnect control-unit plug from adapter cable.
Check contacts, term. 25 (control-unit plug) (corrosion, loose contacts). Contacts must not be able to be pushed back.

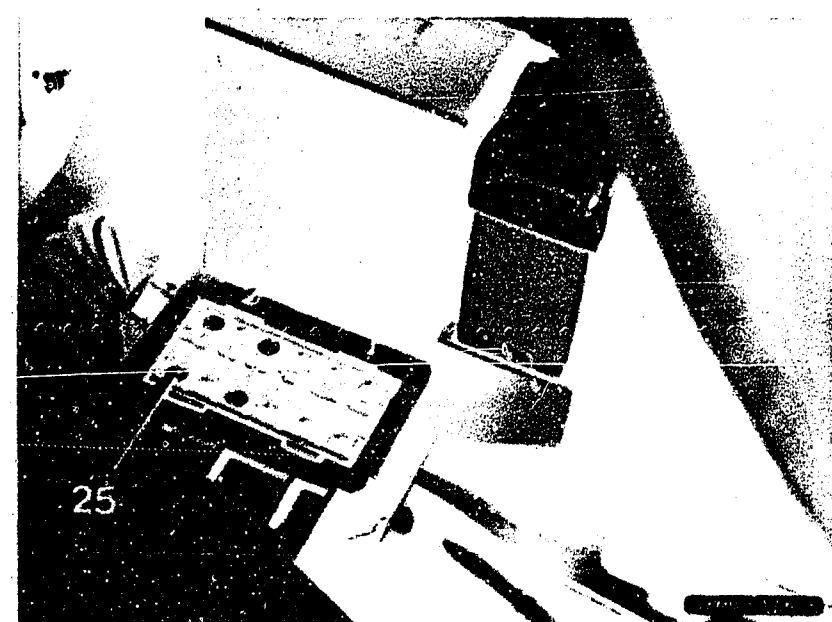
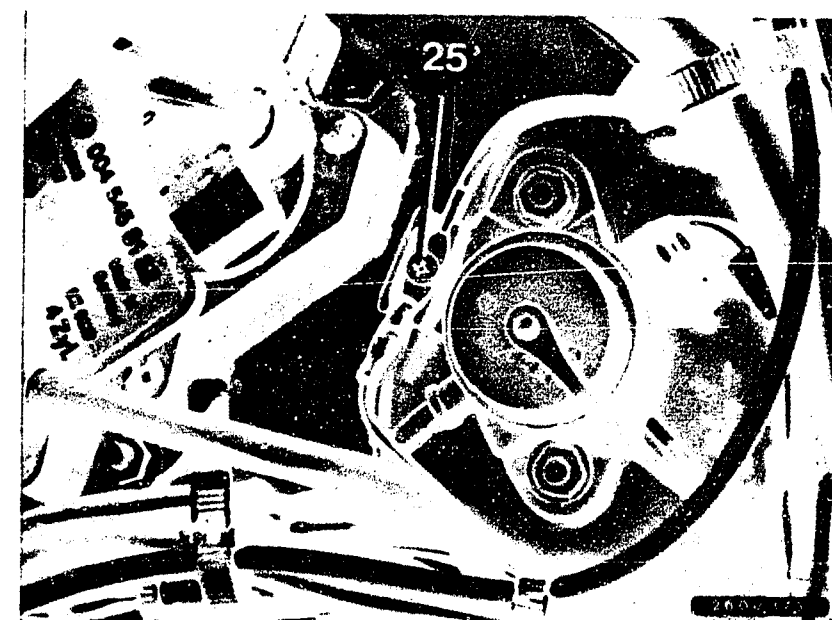
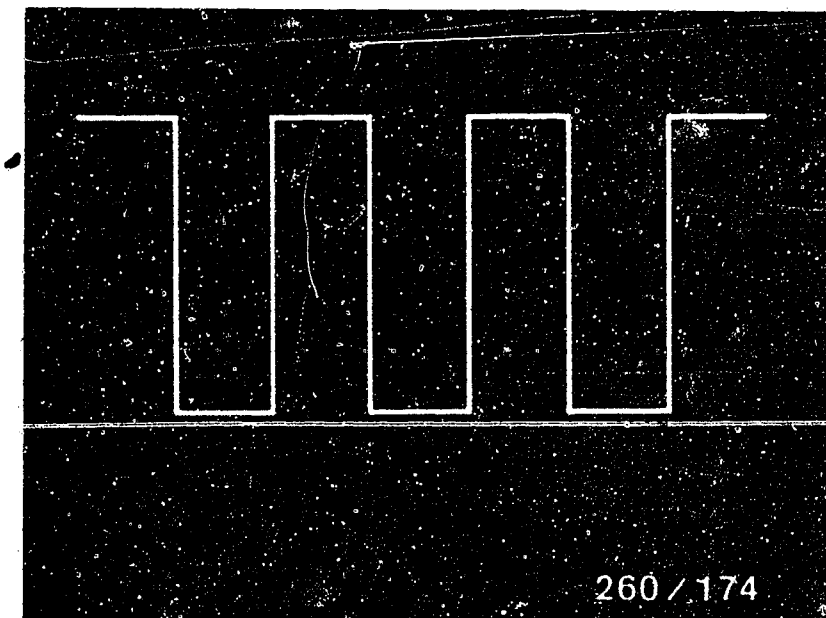
- Continuity test: Control-unit plug term. 25 through threaded connection term. 25 (middle illustration) on diagnostic socket to plug for ignition trigger box and to relay base for compression relay term. 25 (lower illustration)

- Insulation test: test control-unit plug term. 25 to ground (term. 2) (nominal value: $\infty\Omega$)

- Inspect ignition.

yes

Continued in next test step



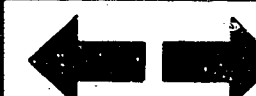
D7

Test chart for universal test adapter
Mercedes-Benz



D8

Test chart for universal test adapter
Mercedes-Benz



Test step 12:

Operation: Position:

Program switch "V": 6

Program switch "Ω" 21

Subject of testing:

Voltage supply (term. 15) (terms. 13/2)

Measuring equipment: Multimeter (V-range)

Measuring range: 15 V

Connection: Test jacks
(red = +, black = -)

Operation in vehicle:
Connect control unit.
Switch on ignition.

Test specification (reading): > 10 V

Is test specification reached?

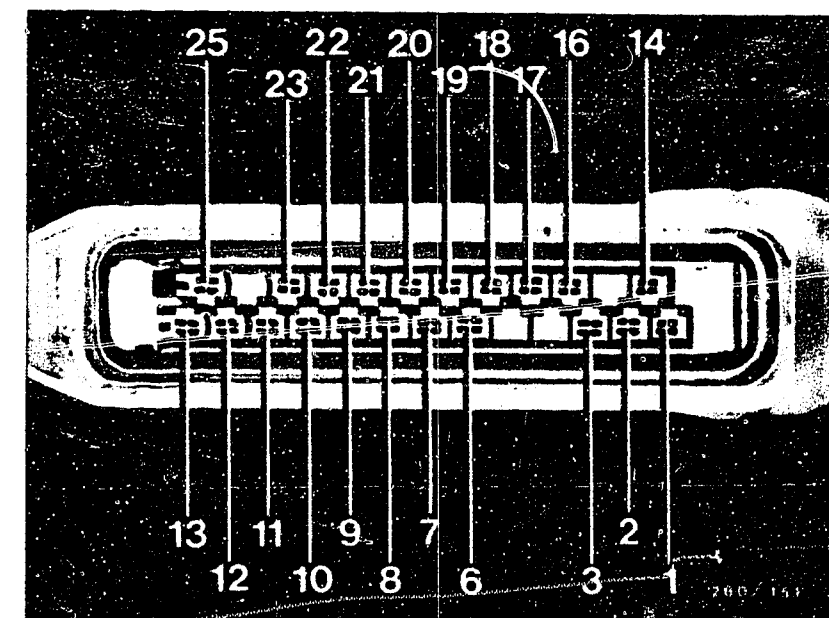
no

Trouble-shooting:

- Inspect fuse (term. 15).
- Switch off ignition, pull control-unit plug from adapter cable. If necessary use circuit diagram.
- Inspect spring contacts on control-unit plug (terms. 13/2) - corrosion, loose contacts. The spring contacts must not be able to be pushed back.
- Test term. 13 (control-unit plug) to ignition lock for continuity.
- Test term. 2 (ground) from control-unit plug to battery (ground - term. 31) for continuity.

Remedying defects:

Eliminate contact resistances, open circuits and short circuits. If necessary replace Ecotronic control unit.



yes

Continued in next test step

D9

Test chart for universal test adapter
Mercedes-Benz



D10

Test chart for universal test adapter
Mercedes-Benz



Test step 13:

Operation:

Position:

Program switch "V": 7

Program switch "Ω": 21

Subject of testing:

Voltage supply for potentiometer in throttle-valve positioner.

Throttle-valve potentiometer (terms. 18/2)

Measuring equipment:

Multimeter (V-range)

Measuring range: 15 V

Connection: Test jacks
(red = +, black = -)

Operation in vehicle:

Control unit connected,
ignition switched on.

Test specification (reading):

4.5 ... 5.5 V

Is test specification within the tolerance given?

no

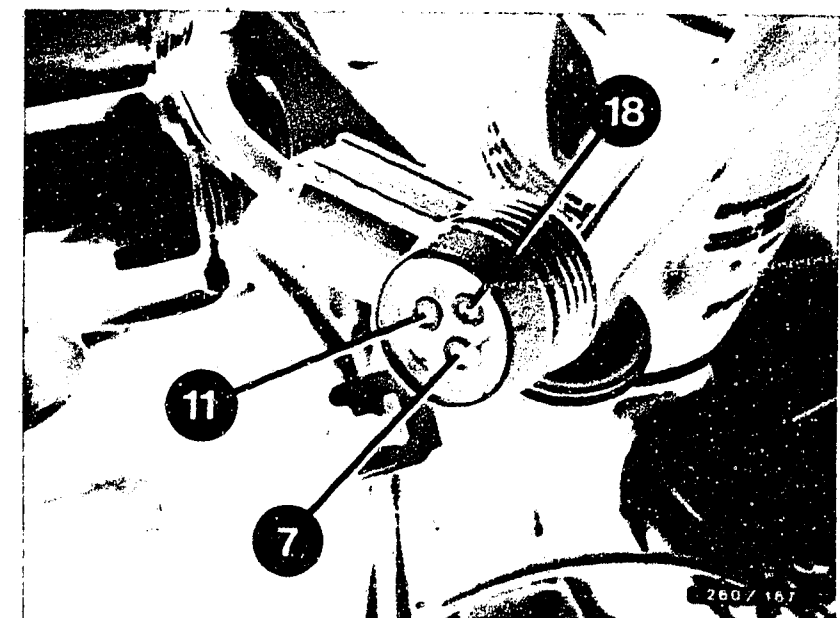
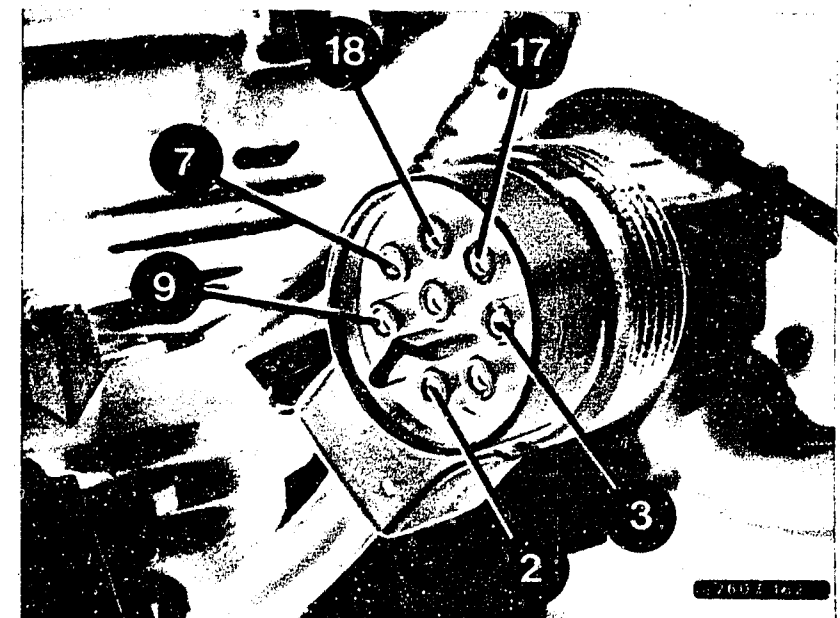
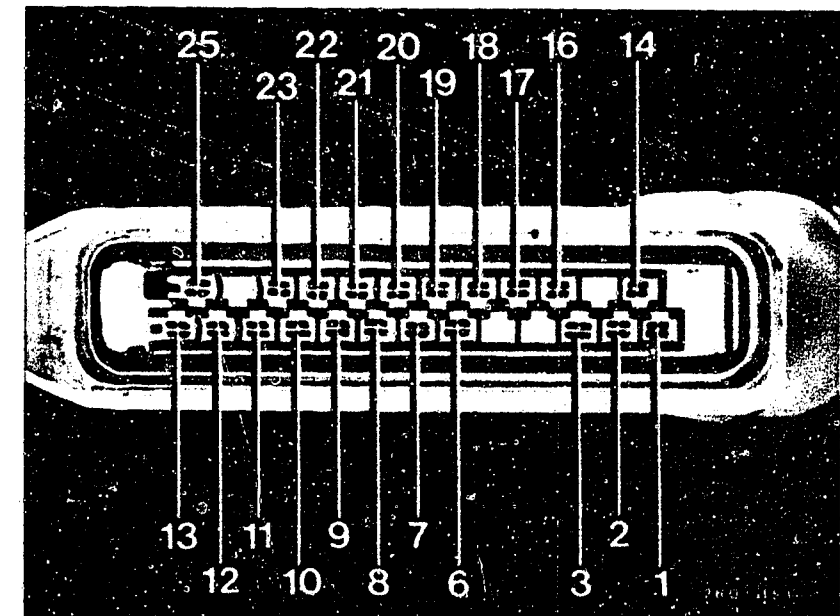
yes

Continued in next test step

Trouble-shooting:

Switch off ignition for testing.
Wait at least 20 seconds, then
disconnect control-unit plug from
adapter cable and adapter cable from
control unit. If necessary use
circuit diagram.

- Inspect spring contacts terms. 18 and 7 on control-unit plug (upper illustration) (corrosion, loose contacts).
Contacts must not be able to be pushed back.
- Disconnect plugs from throttle-valve positioner and throttle-valve potentiometer (middle and lower illustrations).
- Insulation measurement at control-unit plug: term. 18 to term. 7 and to term. 2 (nominal value $\infty\Omega$)
- If necessary replace Ecotronic control unit.



D11

Test chart for universal test adapter
Mercedes-Benz



D12

Test chart for universal test adapter
Mercedes-Benz



Test step 14:

Operation: Position:

Program switch "V": 8

Program switch "Ω": 21

Subject of testing:

Voltage supply, relay for intake-manifold heating (terms. 14/2)

Measuring equipment:

Multimeter
(V-range)

Measuring range: 15 V

Operation in vehicle:

Ignition switched on, engine running. Engine temperature still < 65°C.

Test specification (reading):
< 10 V

Is test specification reached?

yes

Continued in next test step

Trouble-shooting:

Switch off ignition.

Disconnect control-unit plug from system adapter cable.

Disconnect honeycomb-heater plug.

Using ohmmeter, check following leads for short and open circuits:

- From control-unit plug (upper illustration) term. 14 to plug base for intake-manifold heater relay, term. 14 (middle illustration)
- From plug base for intake-manifold heater relay, term. 26 to plug for honeycomb heating element
- From control-unit plug term. 13 to plug base for intake-manifold heater relay (middle illustration) term. 13 and to relay base for over-voltage protection, term. 13 (lower illustration)
- From plug base for intake-manifold heater relay term. 28 to plug base for over-voltage protection relay term. 28

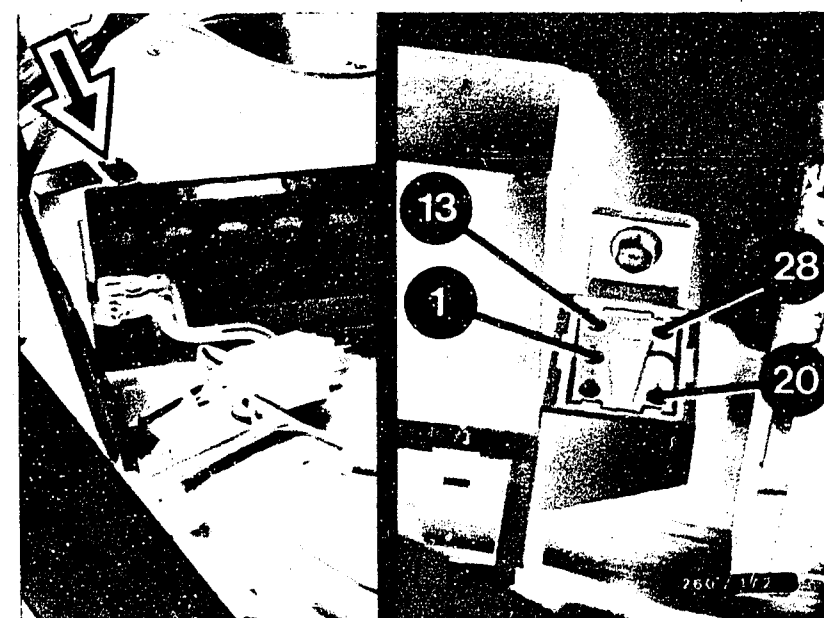
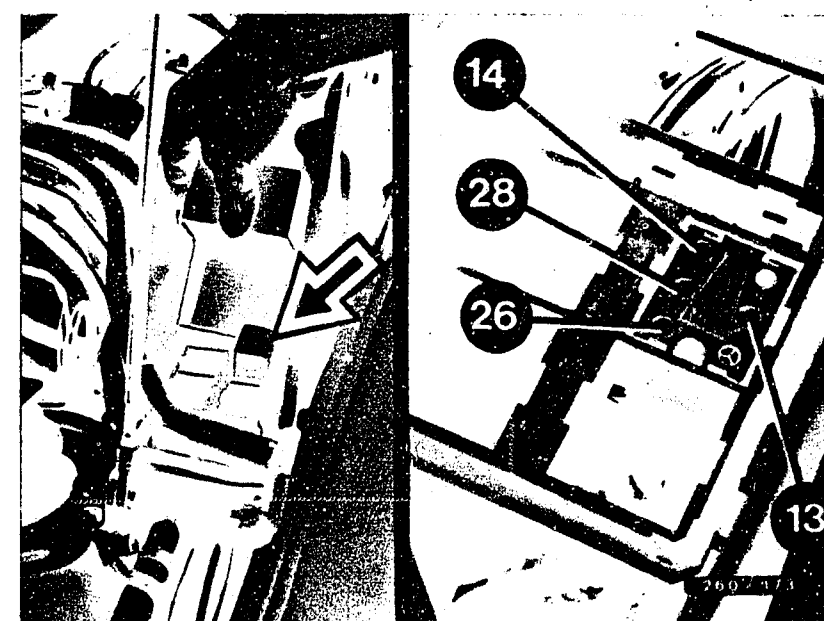
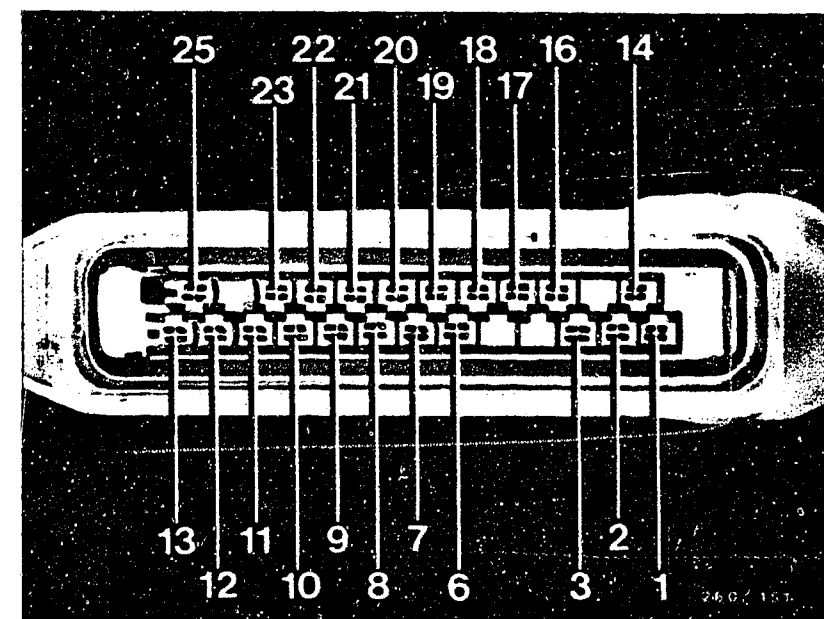
Reading: approx. 0 Ω

- Test term. 14 to term. 2 on control-unit plug:

Reading: ∞Ω

(Intake-manifold heater relay disconnected)

Eliminate contact resistances, open circuits, and short circuits in leads, replace intake-manifold heater relay.



D13

Test chart for universal test adapter
Mercedes-Benz



D14

Test chart for universal test adapter
Mercedes-Benz



Test step 15: (Only on vehicles with air conditioning)

Operation:

Position:

Program switch "V": 9

Program switch "Ω": 21

Subject of testing:

Air-conditioning recognition (terms. 19/2)

Measuring equipment: Multimeter
(V-range)

Measuring range: 15 V

Connection: Test jacks
(red = +, black = -)

Operation in vehicle:

Engine running at operating temperature, air conditioning switched on.

Test specification (reading): > 10 V

Is test specification reached?

no

Trouble-shooting:

Switch off ignition.
Disconnect control-unit plug from system adapter cable.

Using ohmmeter, test lead from control-unit plug term. 19 to plug base for compressor cut-off unit term. 19 (lower illustration):
Reading: approx. 0 Ω

Using voltmeter, measure term. 15 on plug base for compressor cut-off unit to ground:
Reading: > 10 V
(Ignition and air conditioning switched on)

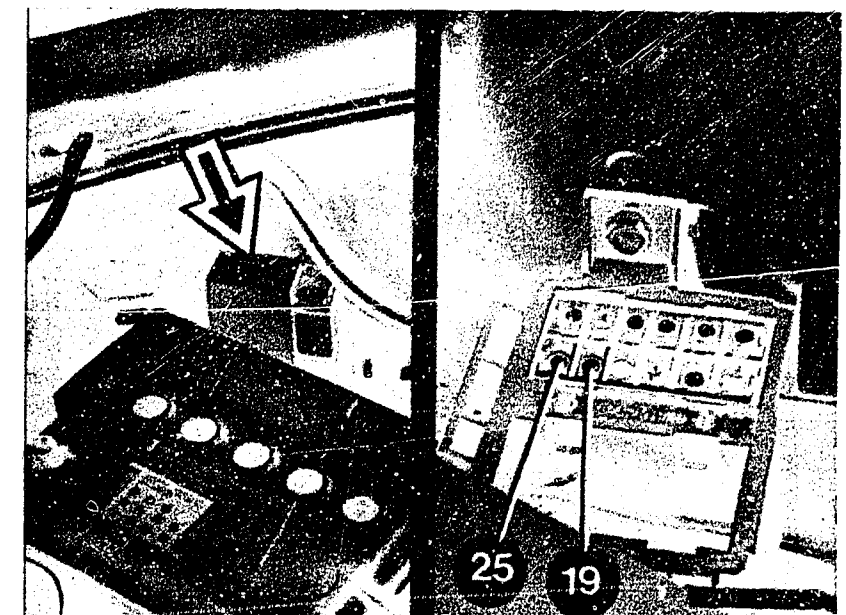
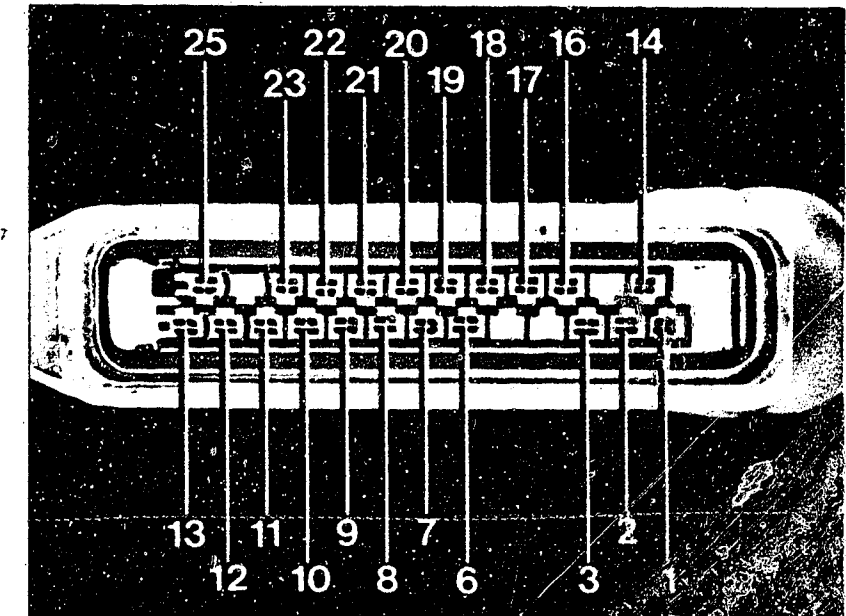
Inspect air-conditioning system

Remedying defects:

Eliminate open circuits, contact resistances, and short circuits in leads.
Repair air-conditioning system

yes

Continued in next test step



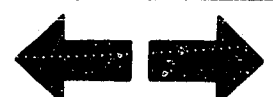
D 15

Test chart for universal test adapter
Mercedes-Benz



D 16

Test chart for universal test adapter
Mercedes-Benz



Test step 16:

Operation: Position

Program switch "V": 10

Program switch "Ω" 21

Subject of testing:

Throttle-valve positioner (leakage) (terms. 17/2)

Measuring equipment:

Multimeter (V-range)

Measuring range: 15 V

Connection: Test jacks
(red = +, black = -)

Operation in vehicle:

Engine running at operating temperature.

Additional operations:

Remove bridge on jacks 1 and 2 on universal test adapter. Press key T4 on universal test adapter. Tappet of throttle-valve positioner moves to overrun position → engine cuts off.

Test specification (reading):

0.1...0.8 V

Note reading:

Voltage must change within 30 seconds by max. 0.2 V.

Is test specification reached?
Does reading fail to change?

yes

Continued in next test step

Trouble-shooting:

Switch off ignition.

Pull plug from throttle-valve switch.

Disconnect control-unit plug.

Using ohmmeter, test lead from control-unit plug term. 17 to plug for throttle-valve positioner term. 17 for short and open circuits.

Inspect throttle-valve positioner:

Note: In order to avoid damage make sure that voltage is applied only to the plug connections indicated.

Apply 12 V to connections term. 2 and 3 (lower illustration) (current limitation approx. 1A).

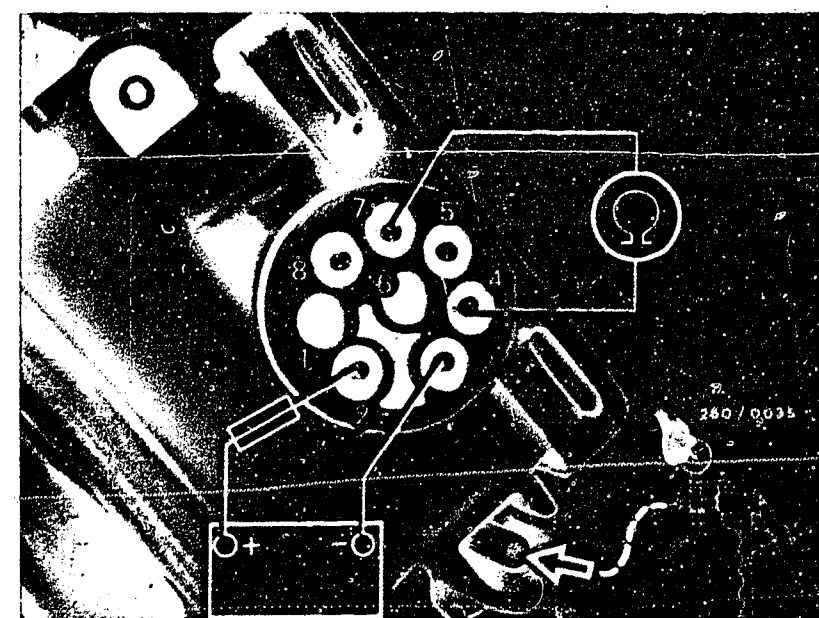
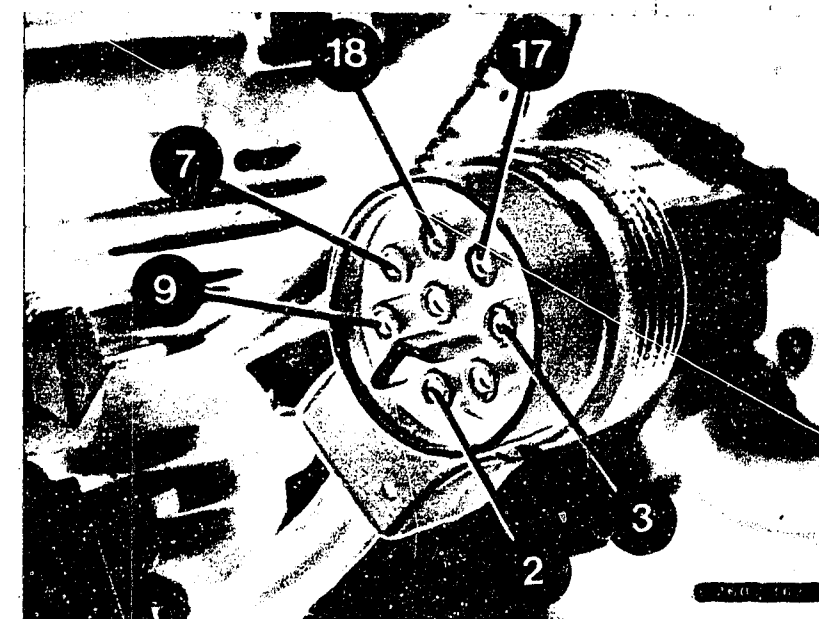
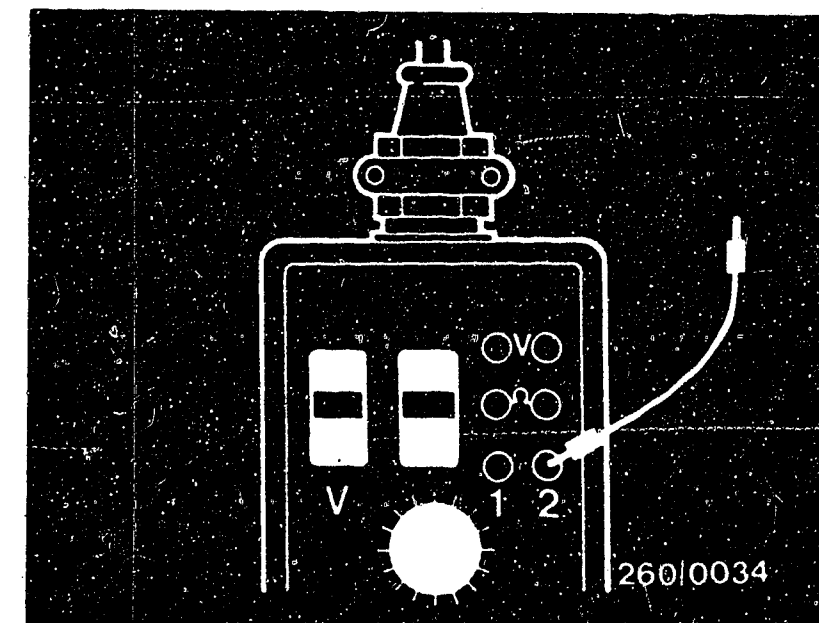
Connect vacuum pump to evacuating valve (lower illustration). Connect ohmmeter to connection terms. 4 and 7.

Generate approx. 250 mbar pressure differential with hand vacuum pump (tappet is pulled in all the way). Disconnect voltage source. Note down resistance measured. Remove vacuum pump.

The measured resistance may change within 1 minute by max. 200 Ω. If necessary, replace throttle-valve positioner.

no

Continued on next page



D17

Test chart for universal test adapter
Mercedes-Benz



D18

Test chart for universal test adapter
Mercedes-Benz



Trouble-shooting test step 16 (continued):

- Leak test of non-return valve:

Supply 12 V voltage again to plug connections 2 and 3 and observe ohmmeter.
The resistance measured above can now change in 5 seconds by max. 650 Ω .

- Remove valve.
Remove carburetor.
Turn M4 screws into closing cover and remove it (upper illustration).
Remove parts of non-return valve (lower illustration).

Note:

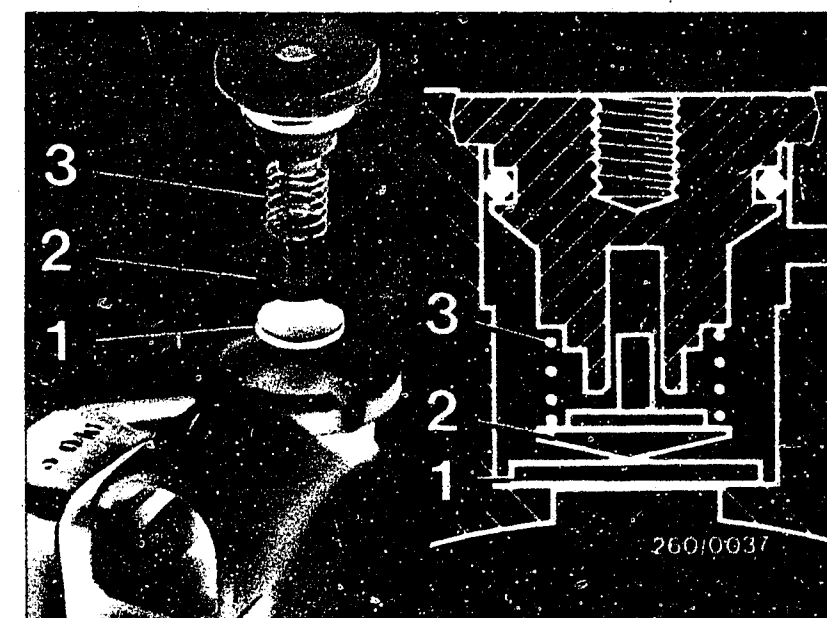
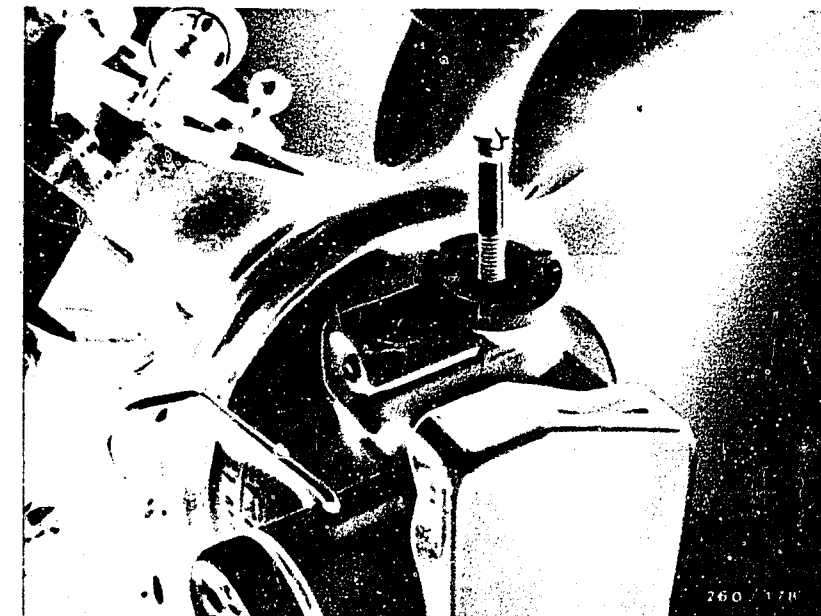
Do not use any sharp-edged tools!

The non-return valve consists of the following parts:

Valve plate (1), guide (2), valve spring (3) (lower illustration).

- Insert new valve parts in the sequence shown. Pay attention to cleanliness.
- Press in closing cover
- Again check non-return valve for sealing

Continued on next page



D 19

Test chart for universal test adapter
Mercedes-Benz



D 20

Test chart for universal test adapter
Mercedes-Benz



Trouble-shooting, test step 16 (continued):

Replacing throttle-valve positioner:

Remove all plugs from carburetor. Remove carburetor. Unscrew fastening nuts (upper illustration, 1) and take out throttle-valve positioner.

Replace idle stop screw (upper illustration, 2).

Install new throttle-valve positioner and replace carburetor. Connect all plugs to carburetor.

Adjusting throttle-valve positioner:

Attach Y-cable to control unit.

Switch on ignition.

Connect vacuum pump to evacuating valve (middle illustration) and generate a constant differential pressure (approx. 250 mbar) during the adjustment procedure (tappet of throttle-valve positioner moves into position thus determined).

In this position, the feeler gauge (2.0 ± 0.05 mm) should slide easily between the throttle-valve stop screw and the stop (1 and 2, lower illustration) .

Note: The throttle-valve stop screw must not be moved.

Set at idle stop screw. (lower illustration, 3)

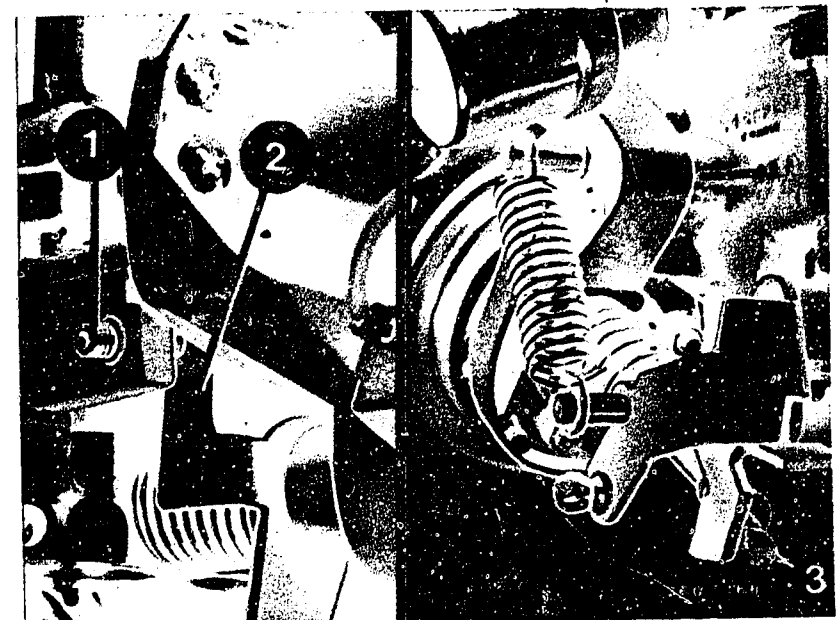
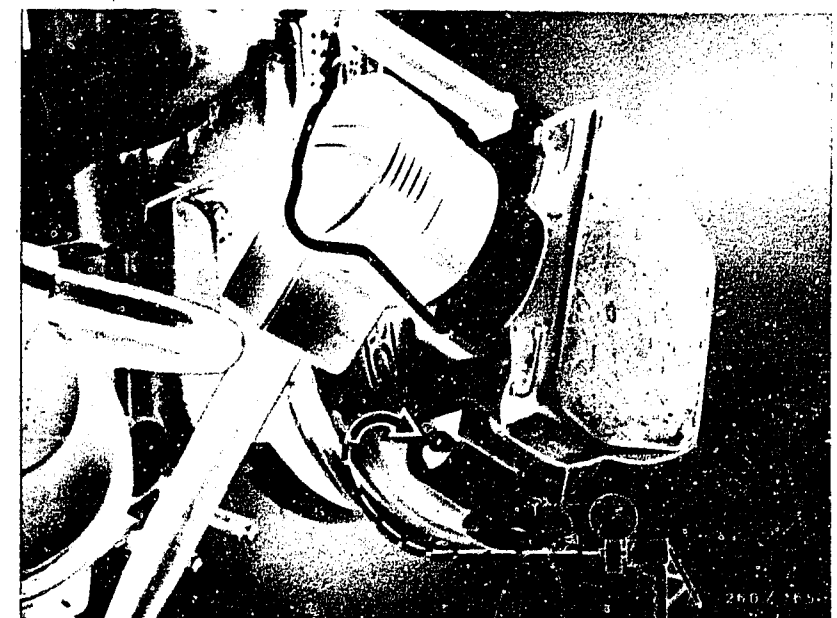
Break off head of idle stop screw.

Restore hose connections.

Test idle.

Switch off ignition.

Remove Y-adapter lead from control unit.



D21

Test chart for universal test adapter
Mercedes-Benz



D22

Test chart for universal test adapter
Mercedes-Benz



Test step 17: must be carried out directly following test step 16!

Operation: Position:

Program switch "V": 11

Program switch "Ω": 21

Subject of testing:

Throttle-valve potentiometer (terms. 11/2)

Measuring equipment: Multimeter
(V-range)

Measuring range: 15 V

Connection: Test jacks
(red = +, black = -)

Operation in vehicle:

Ignition switched on.

Slowly press accelerator pedal from idle to full-load position.

Test specification (reading):

Min.: 0.05 ... 0.6 V

Max.: 4.2 ... 5.5 V

Reading must change steadily between minimum and maximum.

Is test specification reached?

Does reading change steadily?

yes

Continued in next test step

Trouble-shooting:

Test freedom of movement of accelerator cable and throttle-valve section. Switch off ignition.

After 20 seconds disconnect control-unit plug.

Using ohmmeter, test following leads for short and open circuits:

- From control-unit plug term. 11 to plug for throttle-valve potentiometer (middle illustration) term. 11

- From control-unit plug (upper illustration) term. 18 to plug for throttle-valve potentiometer, term. 18

- From control-unit plug term. 7 to plug for throttle-plate potentiometer term. 7

Reading: approx. 0 Ω

- At control-unit plug term. 7 and term. 8 to term. 11

Reading: > 1 M Ω

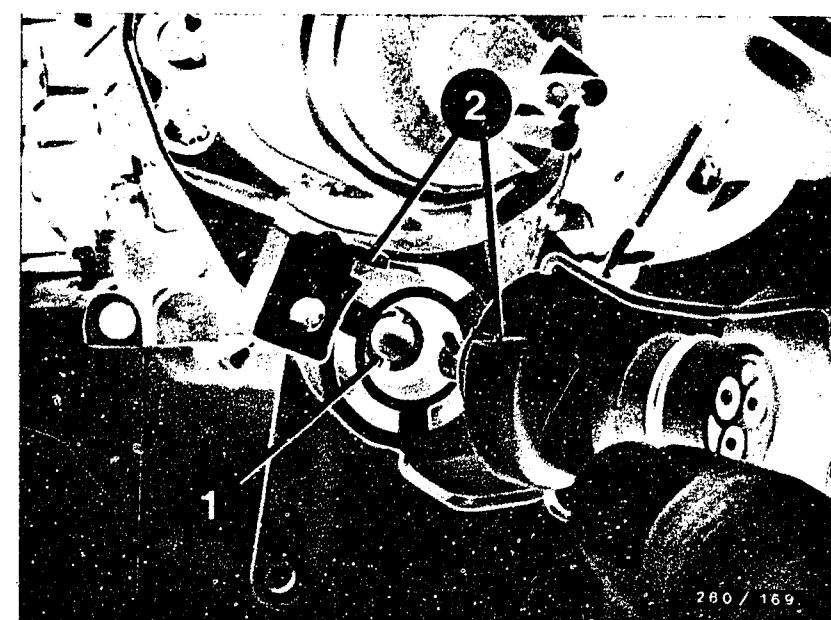
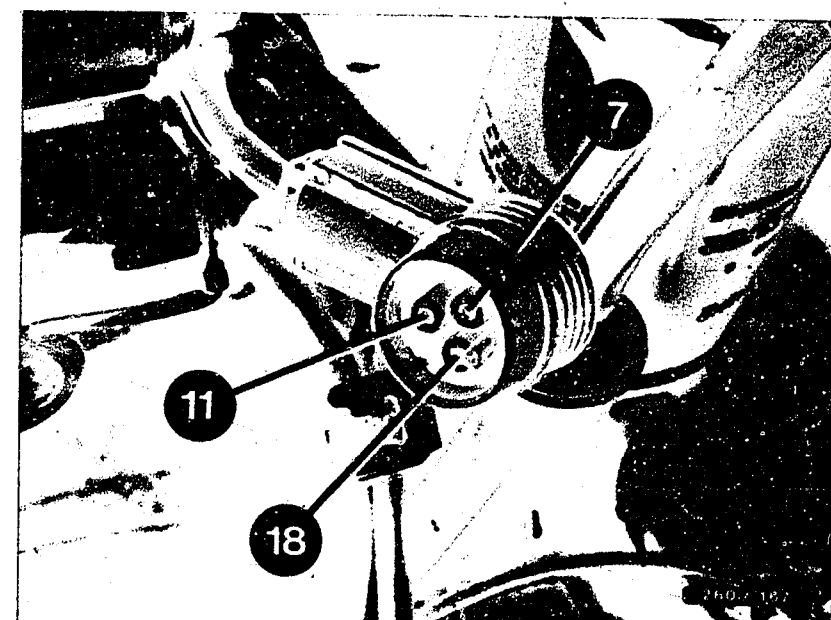
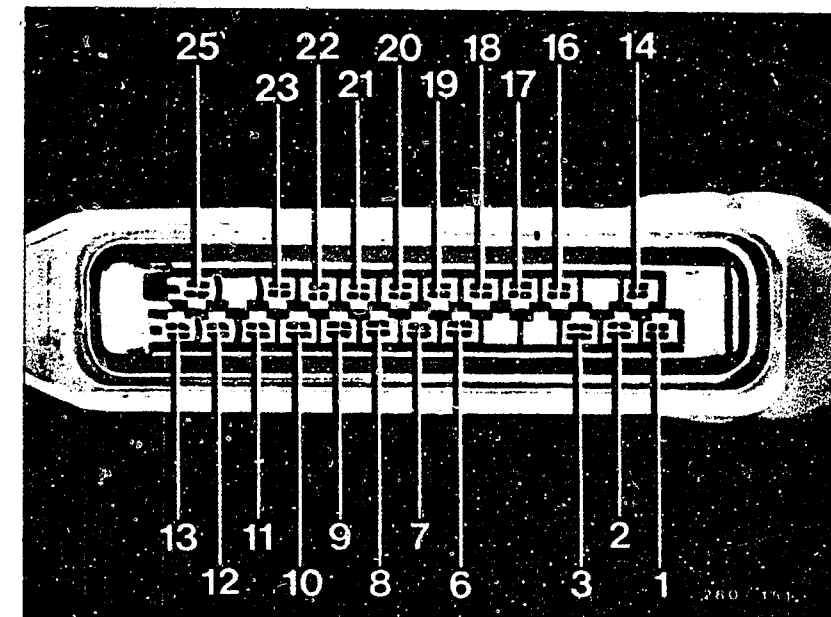
(Throttle-valve potentiometer plug disconnected)

Remedying defects:

Eliminate contact resistances, open circuits, and short circuits in leads.

Eliminate loose contacts.

Replace throttle-valve potentiometer (lower illustration). When removing and inserting the potentiometer pay attention to coupling (1) and detent (2).



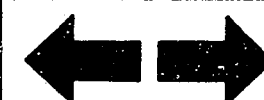
E1

Test chart for universal test adapter
Mercedes-Benz

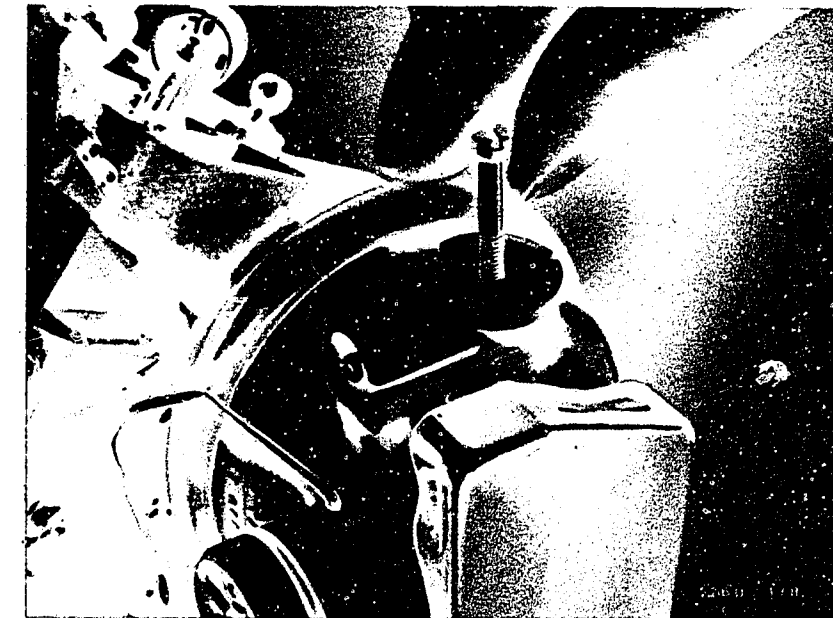


E2

Test chart for universal test adapter
Mercedes-Benz



Test step 18: Note: Jack 1 on universal test adapter must under no circumstances come into contact with ground (e.g. black test inlet)!



Operation: Position:

Program switch "V": 10

Program switch "Ω": 21

Subject of testing:
Throttle-valve positioner
(ventilating side)

Measuring equipment: Multimeter
(V-range)

Connection: Test jacks
(red = +, black = -)

Measuring range: 5 V

Operation in vehicle:
Connect jack 2 on universal
test adapter to positive (e.g.
battery positive) for one
second. Tappet of
throttle-valve positioner comes
out all the way in 1 second.

Test specification (reading):

After 1 sec.
2.8 ... 4.2 V

Is test specification reached?

yes

Continued in next test step

Trouble-shooting:

Test hoses from throttle-valve positioner
(ventilating side) in passenger compartment for
flow-through.

Unscrew M 4 screw in closing cover on
throttle-valve positioner (vent. side). Remove
closing cover (upper illustration).

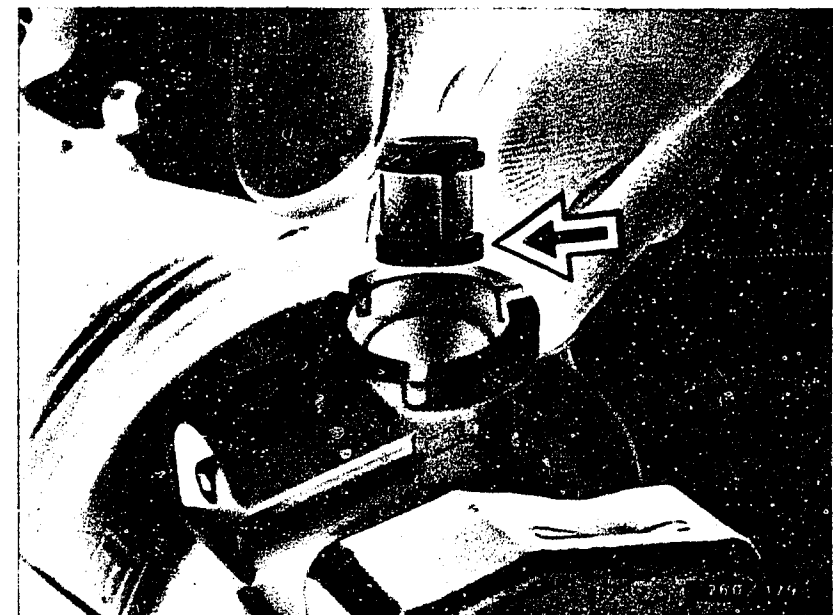
Take out filter (middle illustration) and insert a
new one wide-side first (middle illustration,
arrow).

Press in closing cover.
Pay attention to cleanliness!
Restore hose connection.
Restore bridge between jacks 1 and 2 on universal
test adapter.
Start engine.
Separate bridge between jacks 1 and 2 on universal
test adapter again. Press key T4 on universal
test adapter, engine cuts off. Connect jack 2 on
universal test adapter for 1 sec. to positive
(e.g. battery positive).

Test specification (switch position) 12:
after 1 sec.
2.8 ... 4.2 V

If test specification is not reached replace
throttle-valve positioner.

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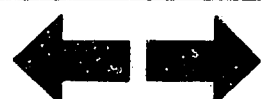
E3

Test chart for universal test adapter
Mercedes-Benz



E4

Test chart for universal test adapter
Mercedes-Benz



Trouble-shooting, test step 18 (continued):

Replacing throttle-valve positioner:

Disconnect all plugs from carburetor. Remove carburetor. Unscrew fastening nuts (upper illustration, 1) and take out throttle-valve positioner.

Replace idle stop screw (upper illustration, 2).
Install new throttle-valve positioner and replace carburetor. Connect all plugs to carburetor.

Adjusting throttle-valve positioner:

Connect Y-cable to control unit. Switch on ignition.
Connect vacuum pump to evacuating valve (middle illustration) and generate constant pressure differential (approx. 250 mbar) during the adjustment process (tappet of throttle-valve positioner moves into position thus determined).
In this position the feeler gauge (2.0 ± 0.05 mm) should slide between the throttle-valve stop screw and the stop (lower illustration, 1 and 2)

Note:

The throttle-valve stop screw must not be moved.

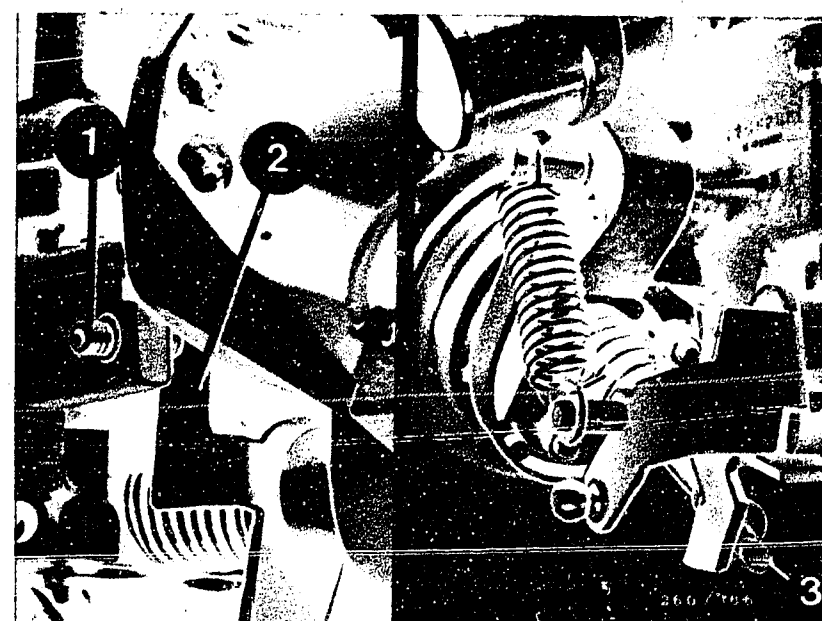
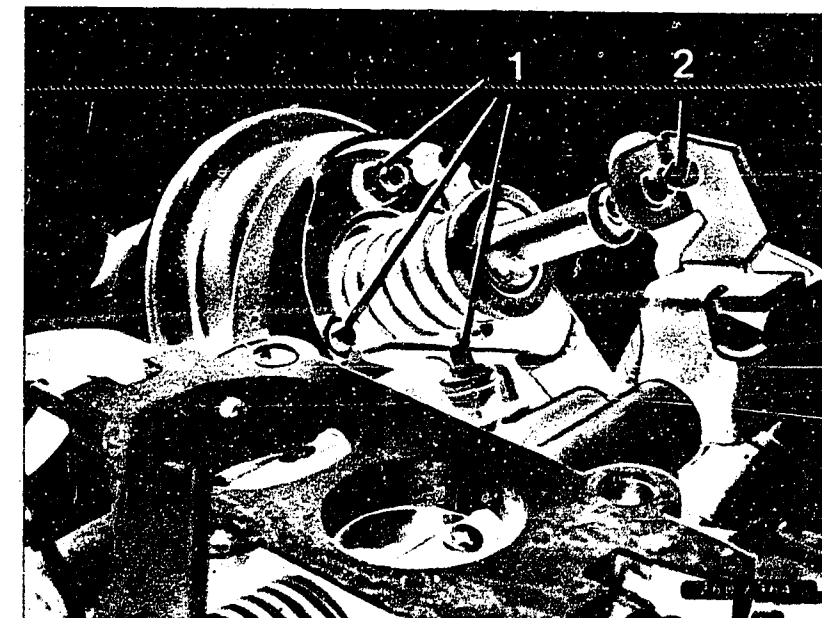
Adjust on idle stop screw (lower illustration, 3). Break off head of idle stop screw.

Restore hose connections.

Test idle.

Switch off ignition.

Remove Y-adapter cable from control unit.



E5

Test chart for universal test adapter
Mercedes-Benz



E6

Test chart for universal test adapter
Mercedes-Benz



Test step 19: Restore bridge between jacks 1 and 2 on universal test adapter.

Operation:

Position:

Program switch "V": 12

Program switch "Ω": 21

Subject of testing:

Choke-valve actuator signal (terms. 12/2)

Measuring equipment:

Oscilloscope (motortester)

Measuring range: Special input

Connection: Test inlets (red clip to red test inlet, black clip to black test inlet)

Operation in vehicle:

Engine running at operating temperature.

Test specification (reading):

See upper illustration

Is test specification reached?

yes

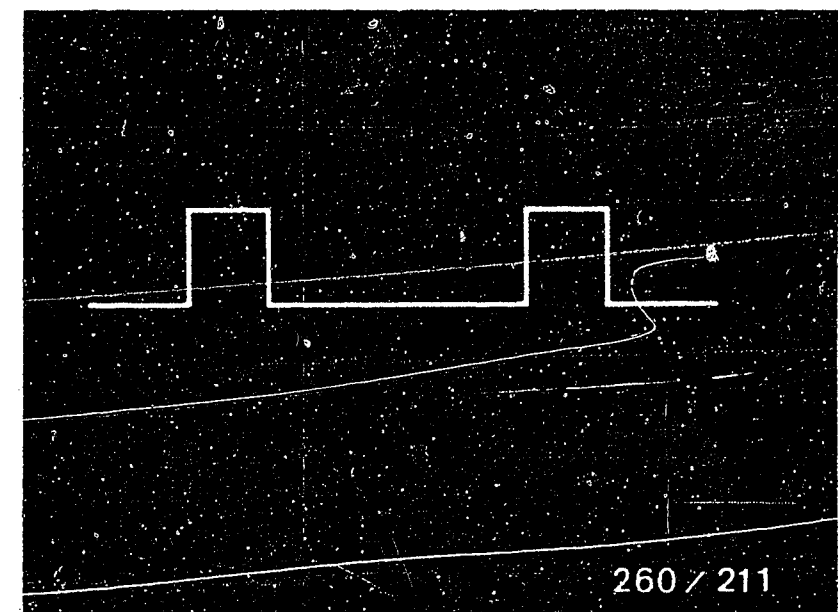
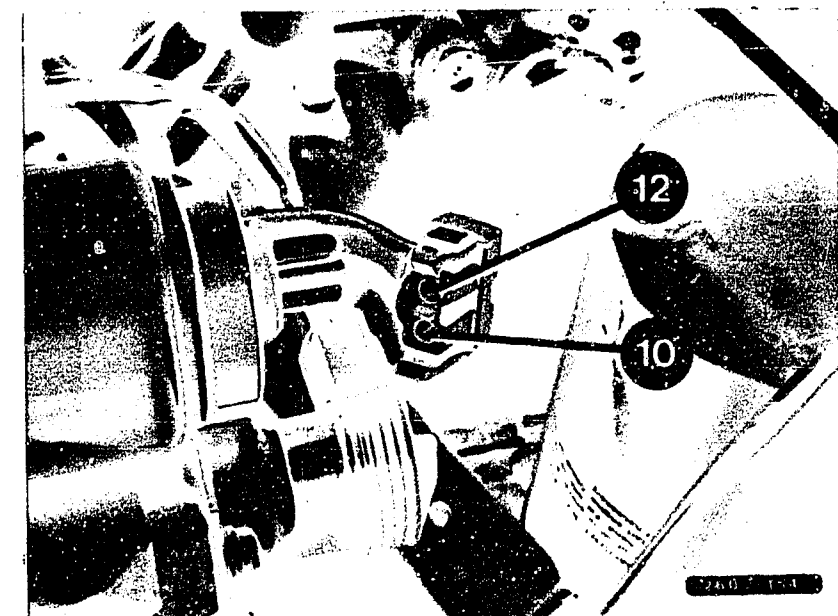
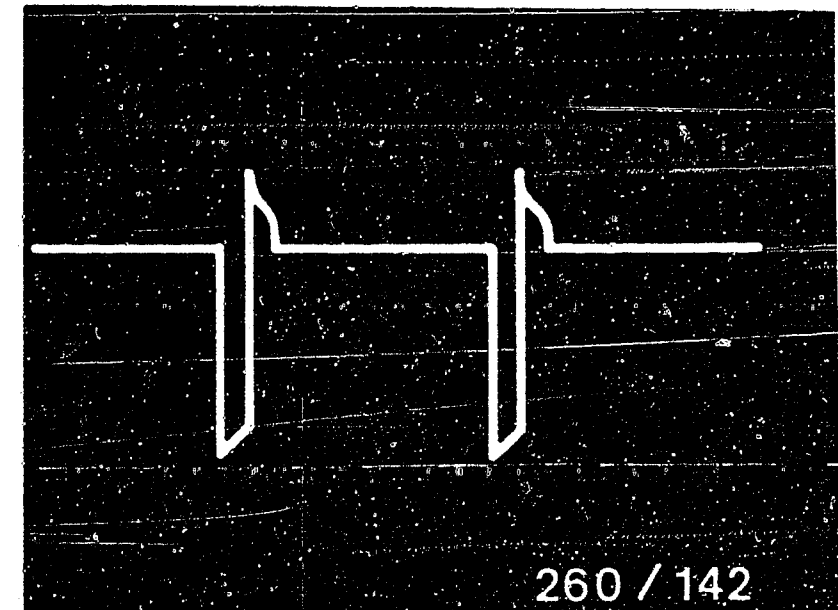
Continued in next test step

Trouble-shooting:

- Switch off ignition.
- Disconnect plug at choke-valve actuator (upper illustration). Connect multimeter (analog) to term. 10 and term. 12 of the choke-valve actuator plug (middle illustration). Select 15 V voltage range (instrument serves only to load the control unit).
- Start engine and check impulse with ignition oscilloscope. For pulse shape see lower illustration.

If there is no pulse, replace the Ecotronic control unit.
If there is a pulse replace the choke-valve actuator.
See Coordinate E9.

Continued on next page



E7

Test chart for universal test adapter
Mercedes-Benz



E8

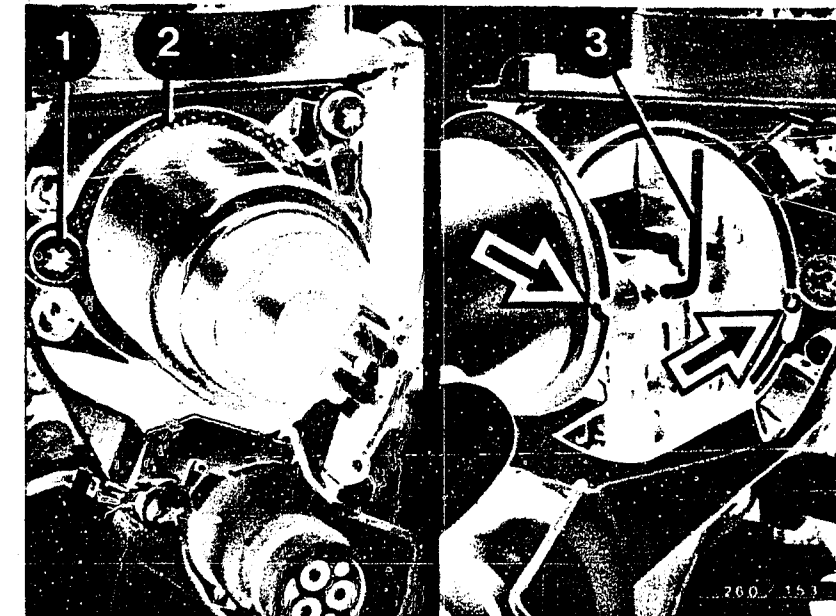
Test chart for universal test adapter
Mercedes-Benz



Trouble-shooting (continued):

Replacing choke-valve actuator:

- Remove air filter.
- Loosen fastening screw (1).
- Turn clamping ring (2) out of bracket.
Remove choke-valve actuator.
- When installing the choke-valve actuator pay attention to detent (arrows) as well as the connection rod (3) to the choke-valve plate.



E9

Test chart for universal test adapter
Mercedes-Benz



E10

Test chart for universal test adapter
Mercedes-Benz



Test step 20:

Operation: Position

Program switch "V": 12

Program switch "Ω": 21

Subject of testing:

Cold-running enrichment
(terms. 12/2)

Measuring equipment:

Oscilloscope (motortester)

Measuring range: Special input

Connection: Test inlets (red clip to red test inlet, black clip to black test inlet)

Operation in vehicle:

Engine running at operating temperature.

Additional operation:

Press button T2 on universal test adapter.

Test specification (reading):

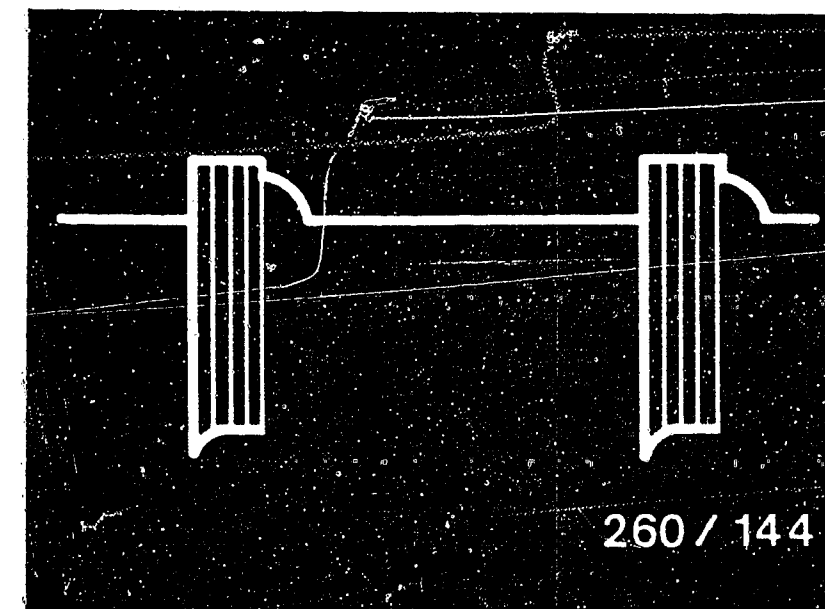
See upper illustration
(when button T1 is pressed signal gets wider)

Does signal get wider?

no

Trouble-shooting:

Replace Ecotronic control unit.



yes

Continued in next test step

E11

Test chart for universal test adapter
Mercedes-Benz



E12

Test chart for universal test adapter
Mercedes-Benz



Test step 21:

Operation

Position:

Program switch "V": 12

Program switch "Ω": 21

Subject of testing:

Acceleration enrichment
(terms. 12/2)

Measuring equipment:

Oscilloscope (motortester)

Measuring range: Special input

Connection: Test inlets

(red clip to red test inlet, black clip to
black test inlet)

Operation in vehicle:

Engine running.

Briefly depress accelerator pedal.

Test specification (reading):

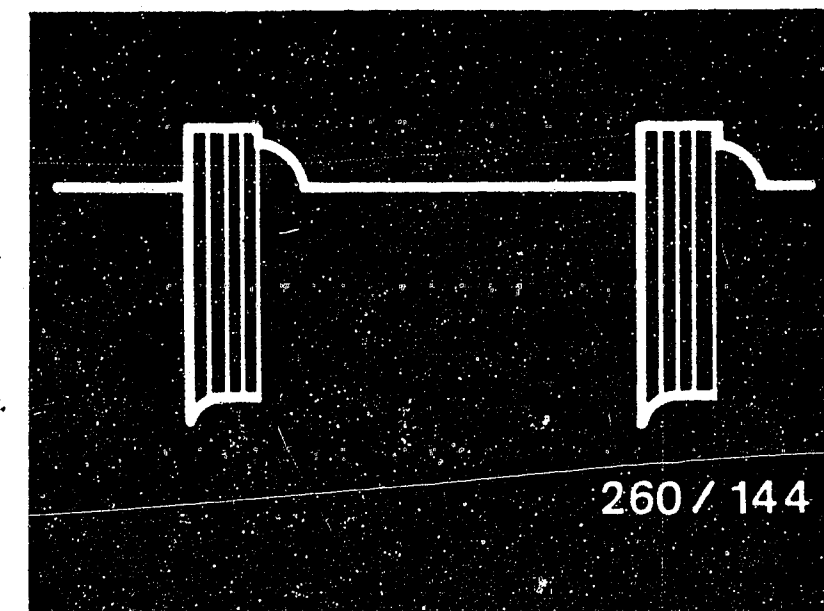
See upper illustration (when accelerator
pedal is depressed signal becomes wider).

Does signal get wider?

no

Trouble-shooting:

Replace Ecotronic control unit.



yes

Continued in next test step

E13

Test chart for universal test adapter
Mercedes-Benz



E14

Test chart for universal test adapter
Mercedes-Benz



Test step 22:

Operation:

Position:

Program switch "V": 13

Program switch "Ω": 21

Subject of testing:

Overrun cut-off (terms. 3/2)

Measuring equipment:

Multimeter (V-range)

Measuring range: 15 V

Connection: Test jacks
(red = +, black = -)

Operation in vehicle:

Engine running at operating temperature.
Keep engine at approx. 3000 min⁻¹.

Additional operation:

Keep button T4 on universal test adapter
depressed and release accelerator pedal →
engine cuts off.

Test specification (reading):

Release accelerator pedal

Between 2400...1400 min⁻¹
briefly > 10 V

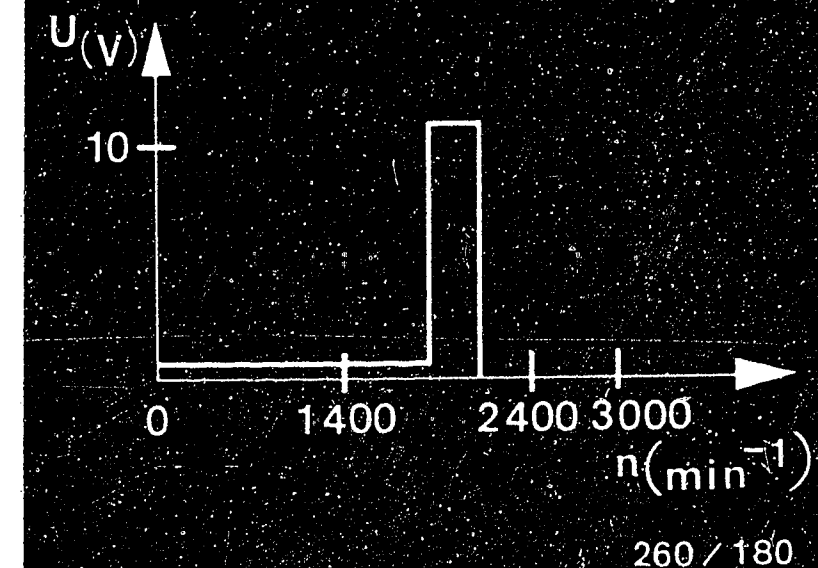
(see upper illustration)

Is test specification reached?

no

Trouble-shooting:

Replace control unit.



yes

Continued in next test step

E15

Test chart for universal test adapter

Mercedes-Benz



E16

Test chart for universal test adapter

Mercedes-Benz



Test step 23:

Operation:

Position:

Program switch "V": 13

Program switch "Ω" 21

Subject of testing:

Actuation of solenoid-operated valve
(ventilating) in throttle-valve positioner
(terms. 3/2)

Measuring equipment:

Multimeter (V-range)

Measuring range: 15 V

Connection: Test jacks
(red = +, black = -)

Operation in vehicle:

Switch off ignition

Test specification (reading):

Ignition off: > 1 V

After approx. 1...3 sec. > 10 V

After further
approx. 1...5 sec. < 1 V

(For voltage curve see upper illustration)

Are test specifications reached?

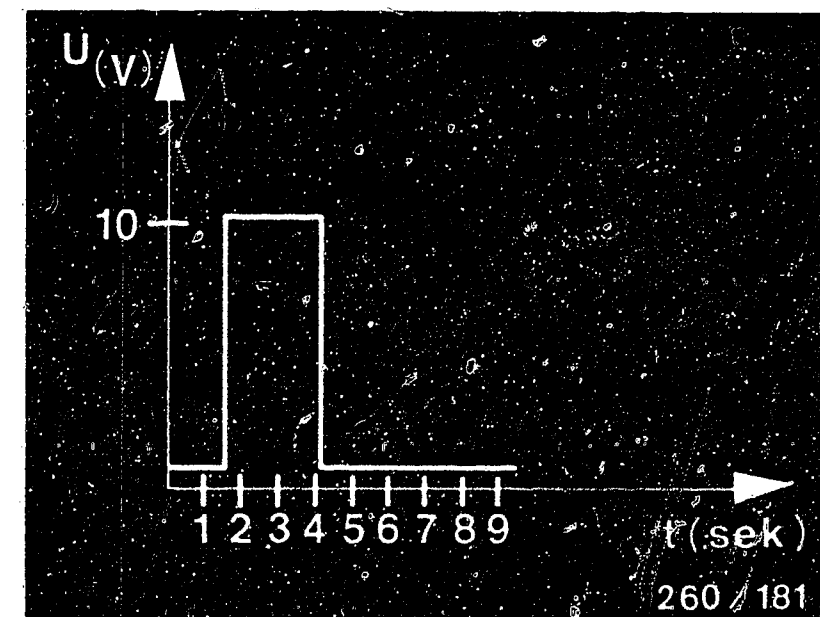
yes

Continued in next test step

Trouble-shooting:

Replace control unit.

no



E17

Test chart for universal test adapter
Mercedes-Benz



E18

Test chart for universal test adapter
Mercedes-Benz



Test step 24:

Operation:

Position:

Program switch "V": 14

Program switch "Ω": 21

Subject of testing:

Solenoid-operated valve (evacuating) in
throttle-valve positioner (terms. 9/2)

Measuring equipment:

Multimeter (V-range)

Measuring range: 15 V

Connection: Test jacks
(red = +, black = -)

Operation in vehicle:

Engine running.

Test specification (reading): < 1 V

Switch off ignition: > 10 V

After approx. 3 sec. < 1 V

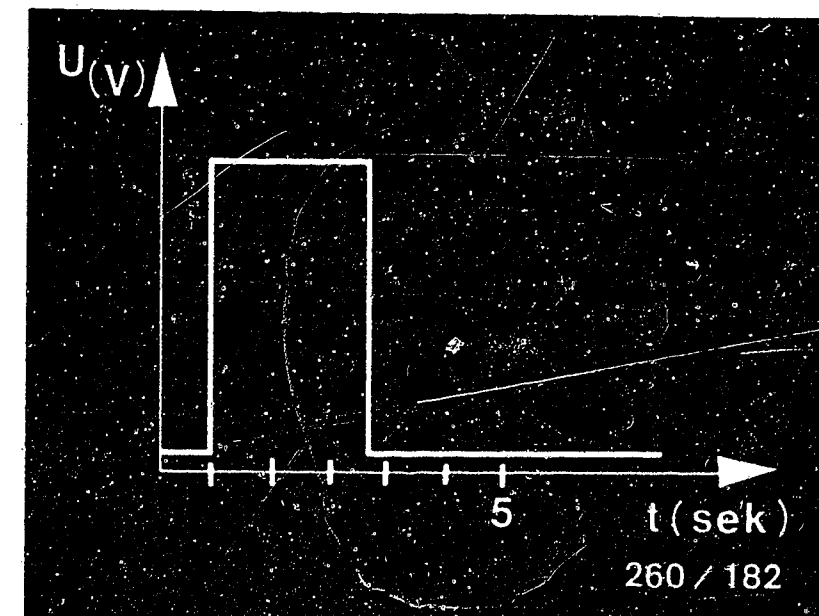
(See upper illustration for voltage curve)

Are test specifications reached?

no

Trouble-shooting:

Replace control unit.



yes

Continued in next test step

E19

Test chart for universal test adapter
Mercedes-Benz



E20

Test chart for universal test adapter
Mercedes-Benz



Test step 25: (Only on vehicles with automatic transmission)

Operation: Position:

Program switch "V": 18

Program switch "Ω": 21

Subject of testing:

Driving-position switch (term. 16/2)

Measuring equipment:

Multimeter (V-range)

Measuring range: 15 V

Connection: Test jacks
(red = +, black = -)

Operation in vehicle:

Driving-position selector lever in "P"
position.

Start engine.

Test specification (reading):

During starting
> 8 V

Is test specification reached?

yes

Continued in next test step

Trouble-shooting:

Switch off ignition. After 20
seconds disconnect control-unit plug
from system adapter cable.

Using ohmmeter, test lead from
control-unit plug (upper
illustration) term. 16 to plug for
solenoid-operated starting switch
term. 16 (lower illustration)

Reading: approx. 0 Ω

Using voltmeter, test at plug for
solenoid-operated switch, term. 16
(lower illustration) to ground:

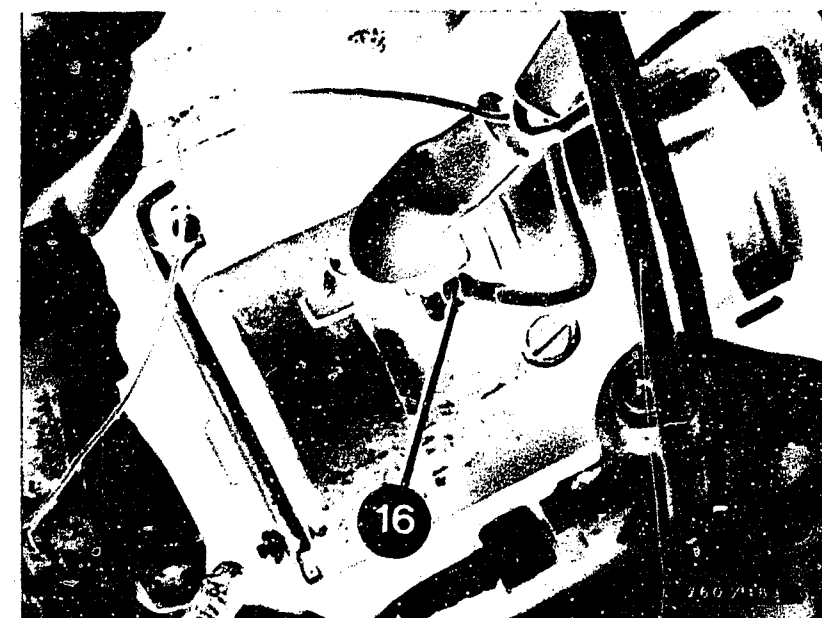
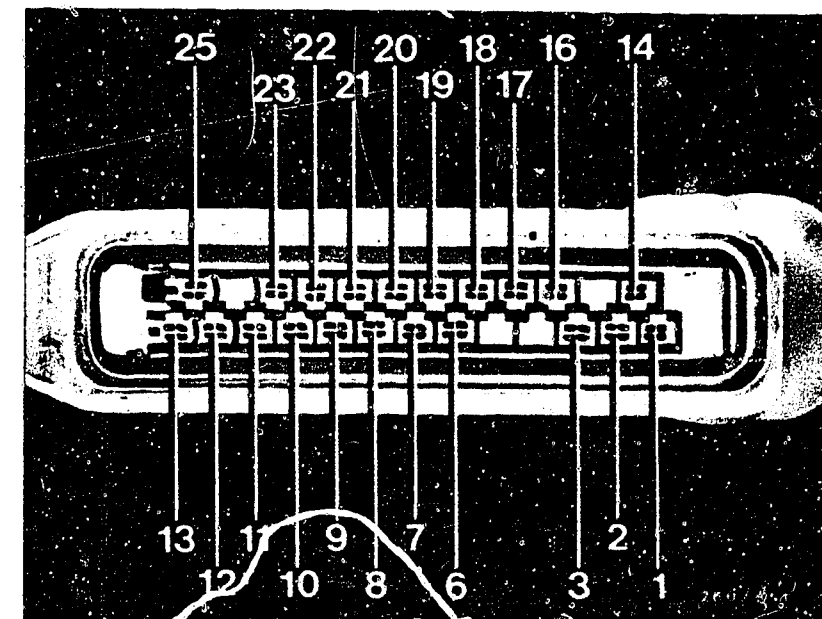
Reading: > 8 V

(during starting)

(Driving-position selector lever in
"P" position)

Remedying defects:

Eliminate contact resistances, open
circuits, and short circuits in
leads.



E21

Test chart for universal test adapter
Mercedes-Benz



E22

Test chart for universal test adapter
Mercedes-Benz



Test step 26:

Operation:

Position:

Program switch "V": 4

Program switch "Ω": 21

Ω - switch positions, 22, 23, and 24 are forbidden during test step 26.

Subject of testing:

Lambda closed-loop control, open-loop control value at integrator output (terms. 23/2)

Measuring equipment: Analog multimeter (V-range)

Measuring range: 15 V

Connection: Test jacks (red = +, black = -)

Operation in vehicle:

Engine running at operating temperature

Test specification (reading):

5 ... 7 V

(Note down test specification)

Is test specification within the tolerance given?

yes

Continued in next test step

Trouble-shooting:

Switch off ignition.

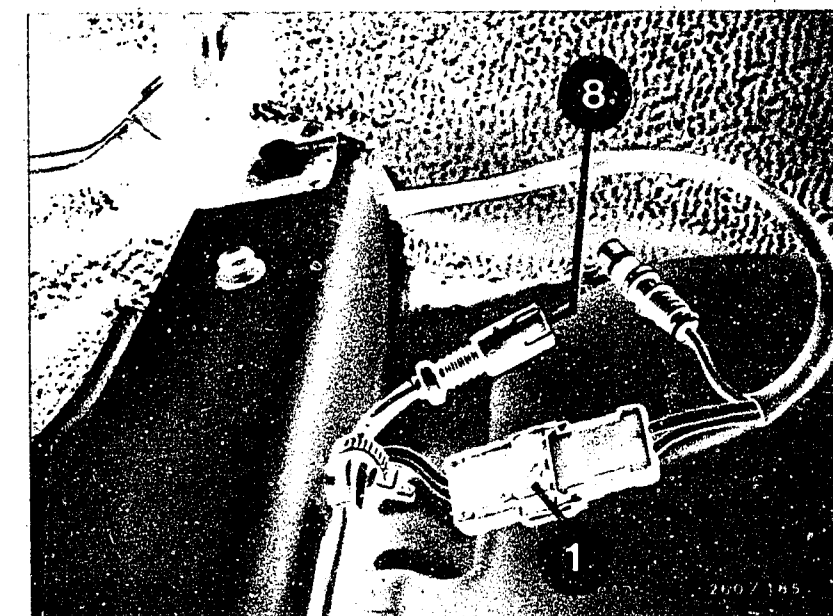
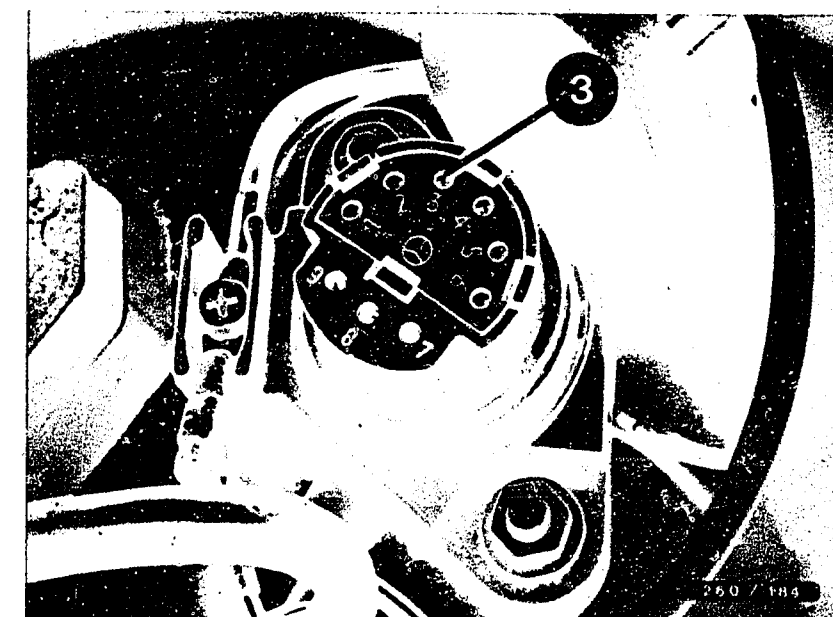
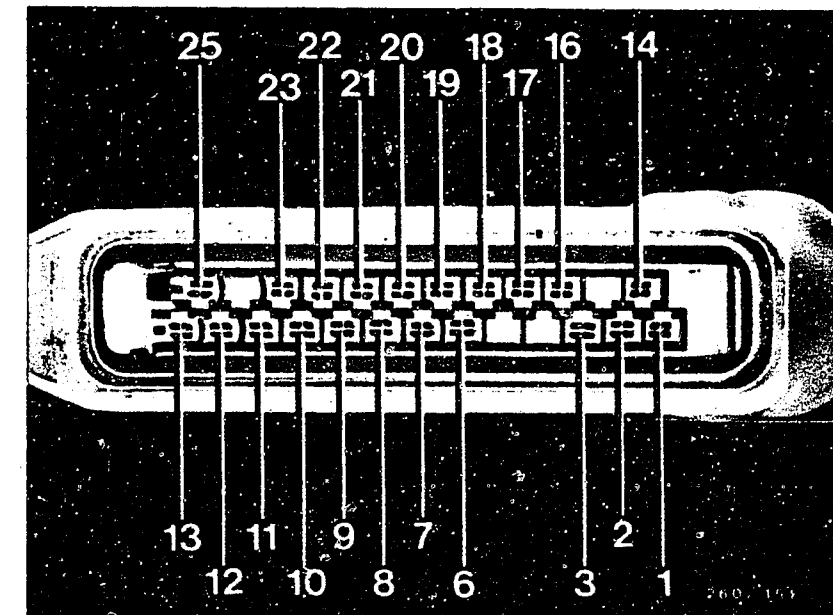
After 20 seconds disconnect control-unit plug from system adapter cable.

Using ohmmeter, test lead from control-unit plug (upper illustration) term. 23 to diagnostic plug (middle illustration) term. 3 for short and open circuits.

Inspect contact term. 23 on control-unit plug (corrosion, loose contact). Spring contact must not be able to be pushed back.

- Test lead from control-unit plug term. 8 to lambda-sensor plug (lower illustration) for short circuit to ground or battery positive.

If no fault is located in the wiring harness, replace the Ecotronic control unit.



F1

Test chart for universal test adapter
Mercedes-Benz



F2

Test chart for universal test adapter
Mercedes-Benz



Test step 27:

Operation:

Position:

Program switch "V": 4

Program switch "Ω": 22

Subject of testing:

Lambda closed-loop control, rich value at integrator output (terms. 23/2)
(Lead term. 8 control-unit plug switched to ground via universal test adapter.)

Measuring equipment: Analog multimeter

Measuring range: 15 V

Connection: Test jacks
(red = +, black = -)

Operation in vehicle:

Keep engine at speed > 2000 min⁻¹.

Test specification (reading):

Dropping back to < 2 V

Is test specification reached?

no

Trouble-shooting:

If reading does not drop back to
< 2 V replace Ecotronic control unit.

yes

Continued in next test step

F3

Test chart for universal test adapter
Mercedes-Benz



F4

Test chart for universal test adapter
Mercedes-Benz



Test step 28:

Operation:

Position:

Program switch "V": 4

Program switch "Ω": 23

Subject of testing:

Lambda closed-loop control value, lean value at integrator output (terms. 23/2)
Lead term. 8 control-unit plug switched to + 2 V through universal test adapter.

Measuring equipment: Analog multimeter

Measuring range: 15 V

Connection: Test jacks
(red = +, black = -)

Operation in vehicle:
Rising to > 9 V

Is test specification reached?

no

Trouble-shooting:

If reading does not climb to > 9 V,
replace Ecotronic control unit.

yes

Continued in next test step

F5

Test chart for universal test adapter
Mercedes-Benz



F6

Test chart for universal test adapter
Mercedes-Benz



Test step 29:

Operation: Position:

Program switch "V": 4

Program switch "Ω": 24

Subject of testing:

Lambda closed-loop control,
closed-loop control value at
integrator output (terms. 23/2)

Measuring equipment: Analog
multimeter

Measuring range: 15 V

Connection: Test jacks
(red = +, black = -)

Operation in vehicle:

Engine running at operating
temperature.

Test specification (reading):
5 ... 7 V

Test specification oscillates
(± 0.5 V) around the control
value found in test step 26.

Is test specification reached?
Does reading oscillate about
control value?

yes

Continued in next test step

Trouble-shooting:

If necessary use circuit diagram in testing.

Reading should oscillate about the open-loop
control value determined in test step 28 (engine
and sensor must be hot!).

If reading remains constant or is outside
tolerances:

CO adjustment (integrator voltage):

The CO content of the exhaust is adjusted directly
via the integrator voltage of the lambda
closed-loop control.

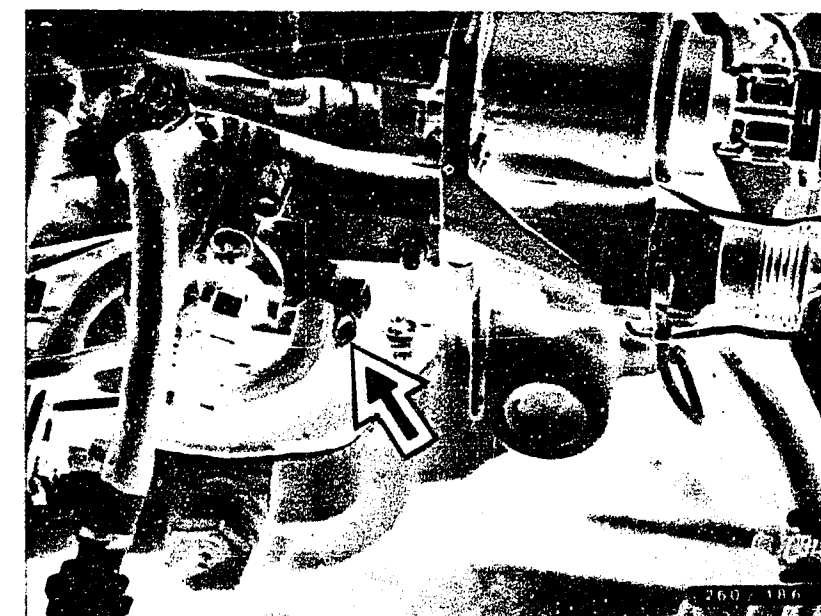
Allow engine to run approx. 30 sec. at a speed of
3000 min⁻¹ to ensure proper operation of lambda
sensor.

Read integrator voltage at analog measuring device.

If the value is smaller than the open-loop control
value determined in test step 26, the basic
mixture setting is too lean.
Screw idle-mixture-adjusting screw (illustration,
arrow) out and back in.

Adjust in small increments. After each increment
check the voltage reading.
Is no adjustment possible?

Continued on next page



F7

Test chart for universal test adapter
Mercedes-Benz



F8

Test chart for universal test adapter
Mercedes-Benz



Trouble-shooting, test step 29 (continued):

Is sensor sufficiently pre-heated?

Allow engine to run at 3000 min^{-1} for 30 sec. Then let engine idle; does voltage now oscillate back and forth?

If not, switch off ignition; after 20 sec. disconnect control-unit plug from system adapter cable. Undo sensor coupling.

Using ohmmeter, test lead from control-unit plug (upper illustration) term. 8 to lambda-sensor plug (lower illustration) for open circuits:

Reading: approx. 0Ω

Using ohmmeter, test at control-unit plug term 8 to ground:

Reading: $> 1 \text{ M} \Omega$
(Sensor coupling disconnected!)

Replace lead if defective.

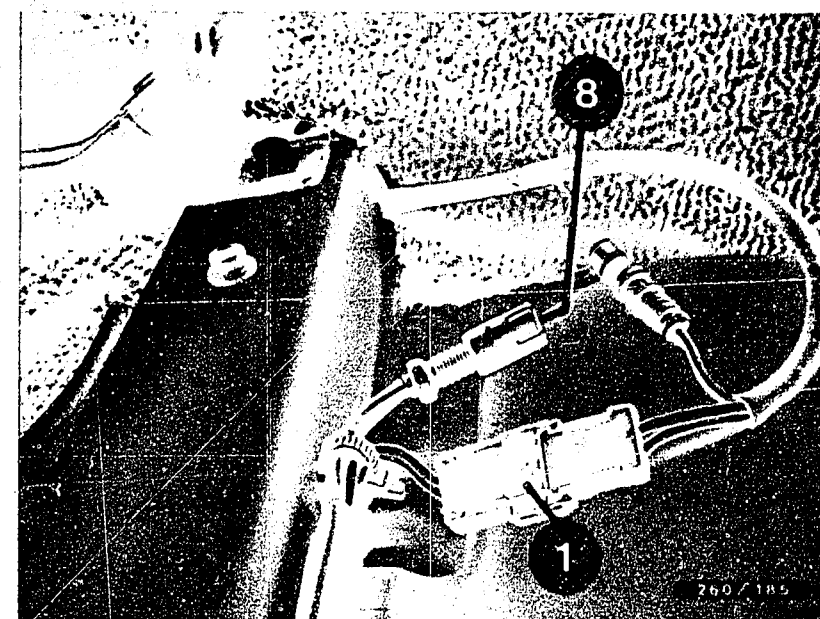
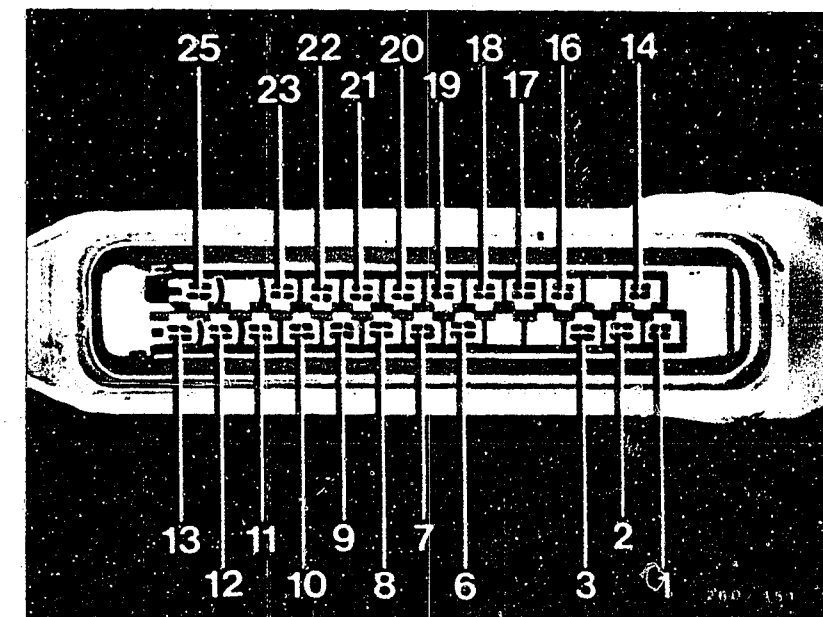
Careful! Sensor lead must be shielded.

The lambda sensor must not be tested directly with the multimeter, as the test current can destroy the lambda sensor!

Does reading oscillate back and forth? If not, lambda sensor is defective.

(When installing a new sensor use grease VS 140 16 Ft.)

Or is Ecotronic control unit defective?



F9

Test chart for universal test adapter
Mercedes-Benz



F10

Test chart for universal test adapter
Mercedes-Benz



Test step 30:

Operation: Position:

Program switch "V": 23

Program switch "Ω": 21

Subject of testing:

Idle signal for EZL control unit (terms. 6/2)

Measuring equipment: Analog multimeter

Measuring range: 15 V

Connection: Test jacks (red = +,
black = -)

Operation in vehicle:

Engine running at operating temperature

Additional operation:

Let engine idle.

Slowly depress accelerator pedal from idle to
full-load position.

Test specification (reading):

See upper illustration

(Idle: < 1 V
Full load > 8 V)

Are test specifications reached?

yes

Continued in next test step

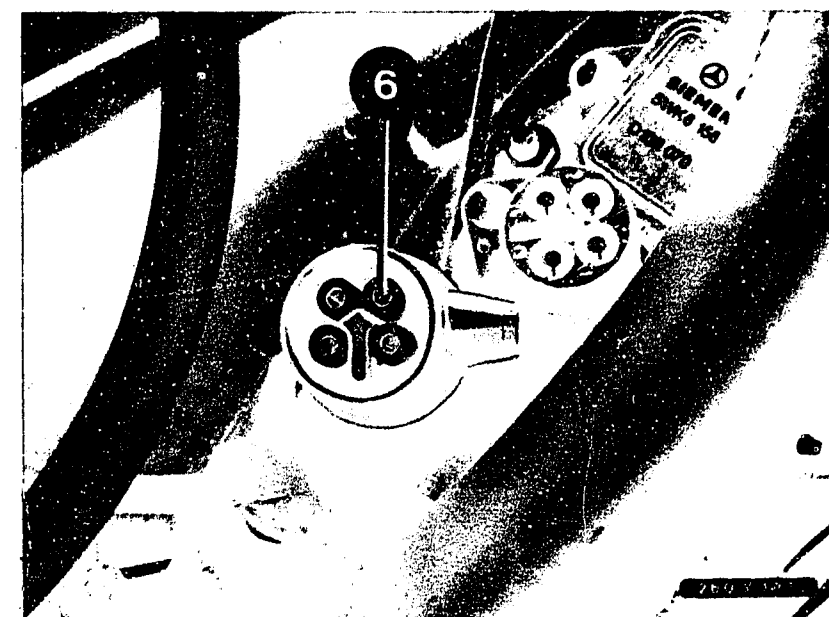
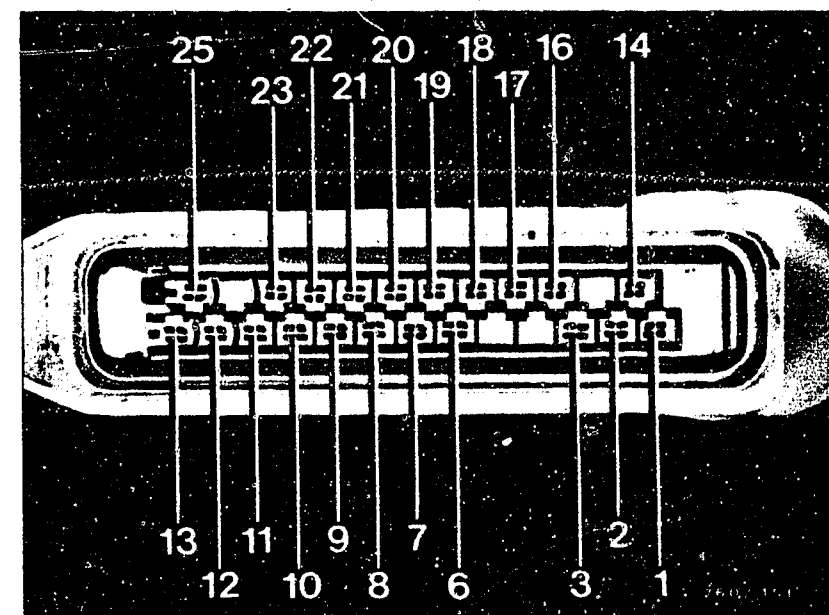
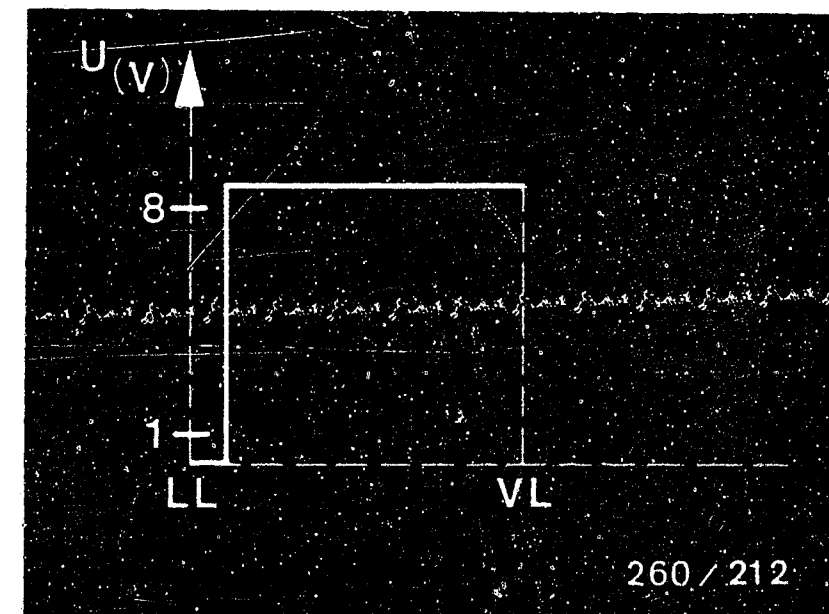
Trouble-shooting:

Switch off ignition. After 20
seconds disconnect control-unit plug
from system adapter cable.

Using ohmmeter, test lead from
control-unit plug (middle
illustration) term. 6 to plug for
EZL control unit (lower
illustration) term. 6 for short and
open circuits.

Inspect ignition system.

If no fault is located in wiring
harness or ignition system, replace
Ecotronic control unit.



F11

Test chart for universal test adapter
Mercedes-Benz



F12

Test chart for universal test adapter
Mercedes-Benz



Test step 31: Only on vehicles without lambda closed-loop control

Operation:

Position:

Program switch "V": 23

Program switch "Ω" 21

Subject of testing:

Cold-start enrichment

Measuring equipment: CO analyzer

Measuring range: Vol. % CO

Connection: Tailpipe

Operation in vehicle:

Engine running at operating temperature

Additional operation:

Press button T2 on universal test adapter

Test specification (reading):

1.0 ± 0.5 vol. % CO

Button T1 pressed, CO concentration rises to
3 ... 6 vol. % CO

Are test specifications reached?

yes

Testing with the universal test adapter is
completed.

If the fault has not been located, or if
other information is required for remedying
the fault, proceed per the trouble-shooting
chart (B3...B6).

Trouble-shooting:

Switch off ignition:

Remove air filter. Check to see
whether connection rod is engaged on
choke-valve actuator lever and
choke-valve plate.

Test choke-valve plate for freedom
of movement:

Close choke-valve plate (upper
illustration, arrow) by hand.

Idle-air correction needle must not
catch.

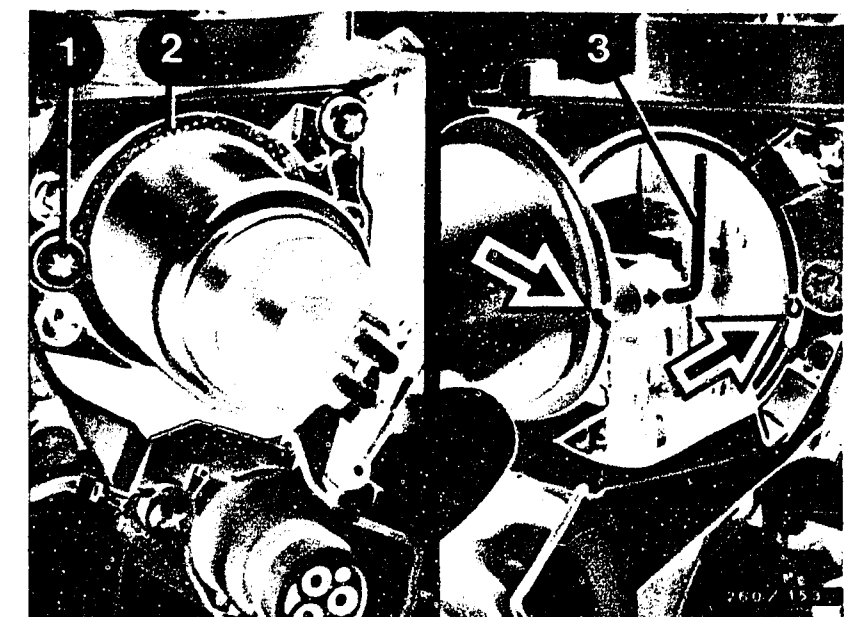
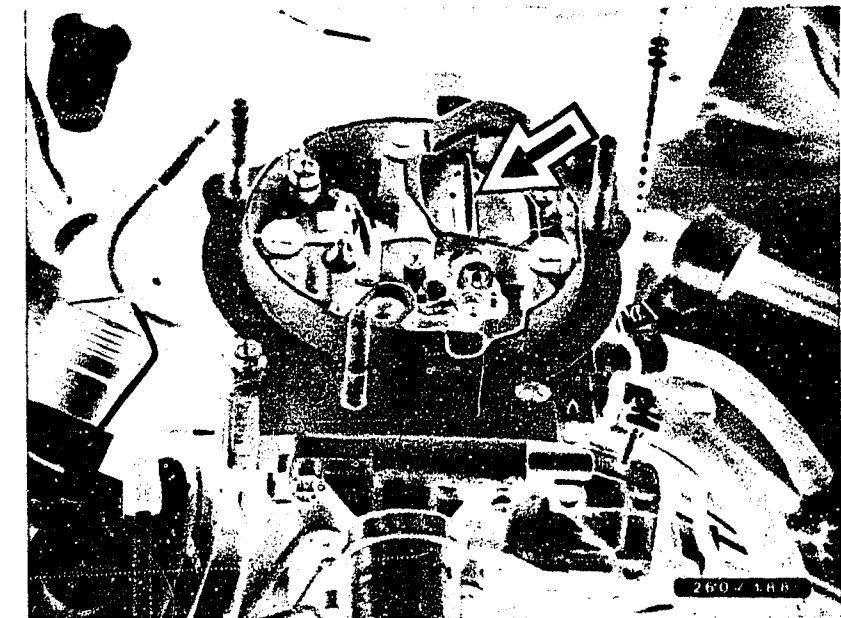
The choke-valve plate should re-open
all the way by itself.

If necessary, make the connection
rod to the choke-valve plate
moveable (e.g. with WD 40).

Do not bend!

If choke-valve actuator will not
move readily, replace:

- Unscrew fastening screw, lower
illustration (1).
- Turn clamping ring (2) out of
holder. Remove choke-valve
actuator.
- When installing the choke-valve
actuator, pay attention to detent
(lower illustration, arrows) as
well as to the connection rod (1)
to the choke-valve plate.



F13

Test chart for universal test adapter
Mercedes-Benz



F14

Test chart for universal test adapter
Mercedes-Benz



11. Component testing

11.1 Incorrect operation

Start per specification (accelerator pedal in idle position).

11.2 Leakage in vacuum system (entry of air)

Visual check, or if unsure, as follows:

Unscrew air filter, close upper part of carburetor with a suitable cover (cover must have a small opening for the compressed-air gun).

If necessary seal exhaust.

Using compressed-air gun, blow air through the opening of the cover into the intake-manifold system.

Throttle plate must be fully open.

Brush seal points (carburetor flange, intake manifold) with soapy water or spray with leak-detector spray (e.g. Gupoflex).

In no case may combustible liquids be used for leak testing!

Bubbles or foam indicate leakage.



11.3 Testing fuel pressure:

Test fuel pressure with pressure-vacuum tester:

Unscrew fuel delivery line (at operator)

Plug Y-connection piece to carburetor, fuel pump and pressure-vacuum tester.

Make sure connections are tight.

Start engine.

Test specification: 0.1 ... 0.3 bar





11.4 Does fuel meet DIN specifications?

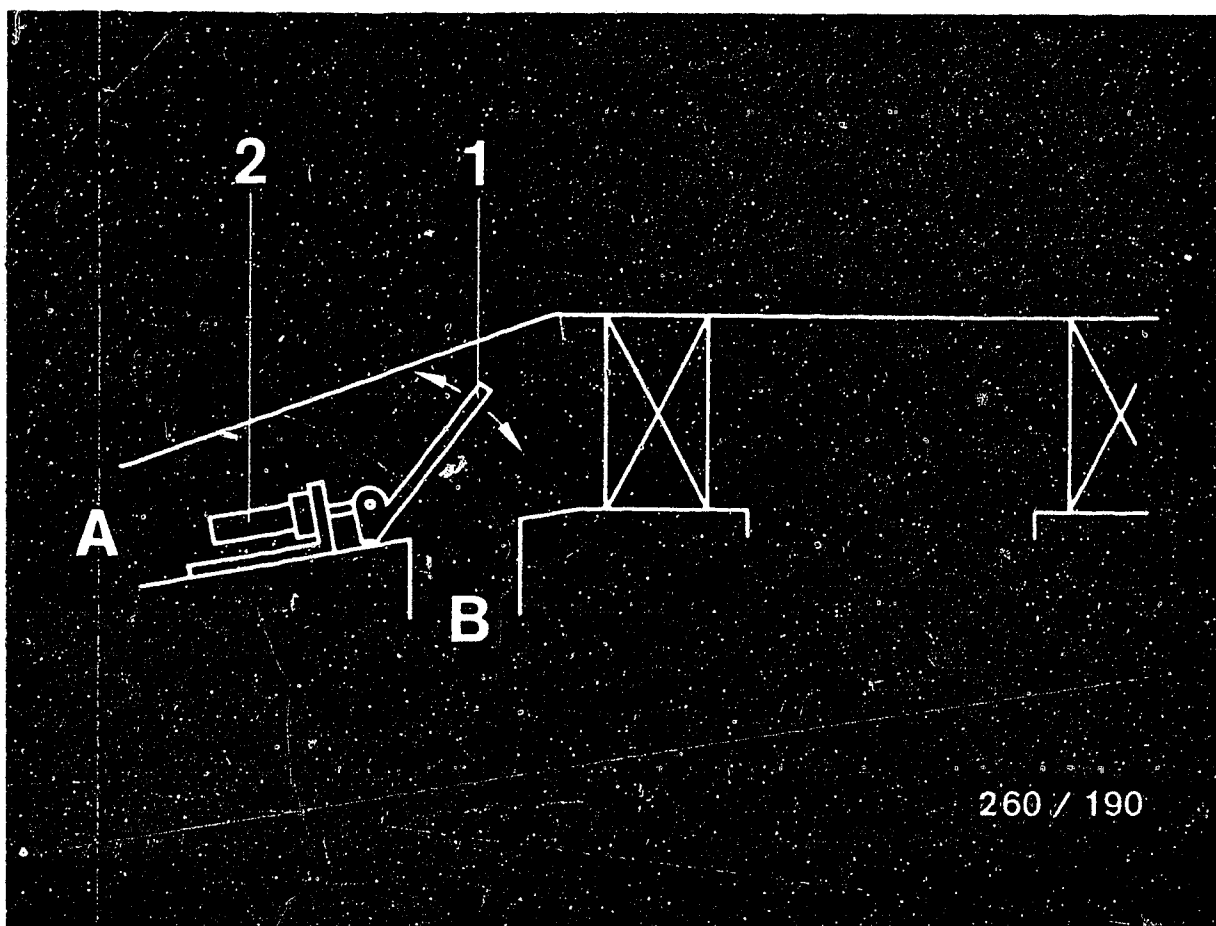
Use fuel which meets DIN standard.

11.5 Checking fuel filter:

Pull out fuel filter using M 3 screws (illustration).

(Always replace filter when repairing carburetor).





11.6 Checking intake-air pre-heating:

(Thermostatic pre-regulated intake air)

With the engine cold (approx. -20°C at expansion element (2) the regulator flap (1) should entirely block off the cold-air duct (A).

If necessary, test with cold spray.

When the engine is warm the warm-air duct (B) should be closed.

If this position is not reached there is a defect in the expansion element (2).



11.7 Testing heating elements for intake-manifold heating and bypass heating:

Testing intake-manifold:

Let engine run. Disconnect plug from dual temperature sensor.

Using voltmeter, test between the plug pins of the intake-manifold heating element (lower illustration):

Reading: $> 10\text{ V}$

Testing bypass heating:

Pull plug from bypass heating element (middle illustration). Using ammeter test between plug and plug pin for bypass heating (middle illustration):

Reading: approx. $3 \dots 6\text{ A}$
(at approx. $+75 \dots 85^\circ$
engine-oil temperature)

Are test specifications reached?

no

- Test at control-unit plug term. 14 to term. 2:

Reading: $> 1\text{ M}\Omega$
(Intake-manifold heating relay disconnected)

- Using voltmeter, test at plug base for intake-manifold heating relay (upper illustration) term. 13 to ground:

Reading: $> 10\text{ V}$
(Ignition switched on)

Using ohmmeter, test lead from relay base for intake-manifold heating term. 26 to plug for intake-manifold heating and to bypass-heating plug for short and open circuits.

Using ohmmeter, test directly at honeycomb heating-element plug pins to ground (middle illustration).

Reading: approx. $< 1.2\ \Omega$
(at approx. $+20^\circ\text{C}$ at heating element,
temperature-dependent)

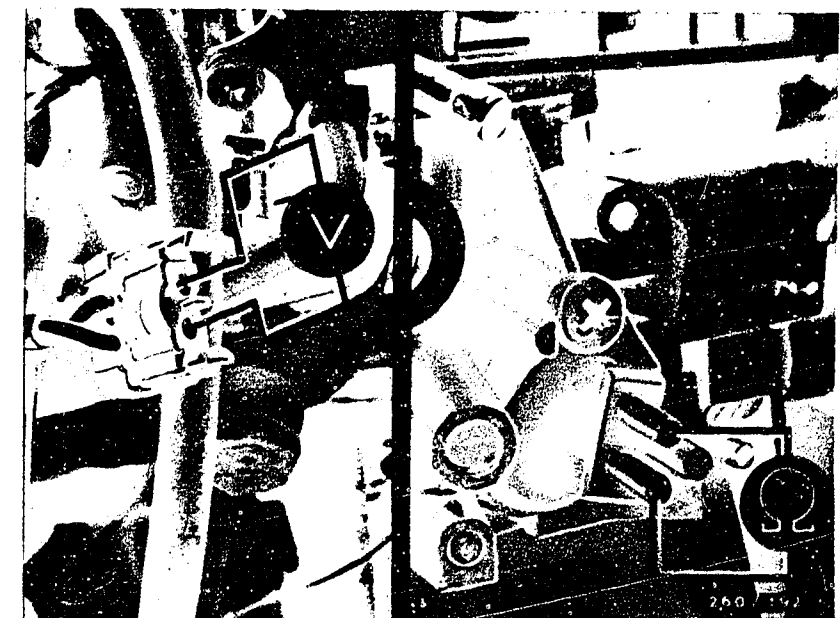
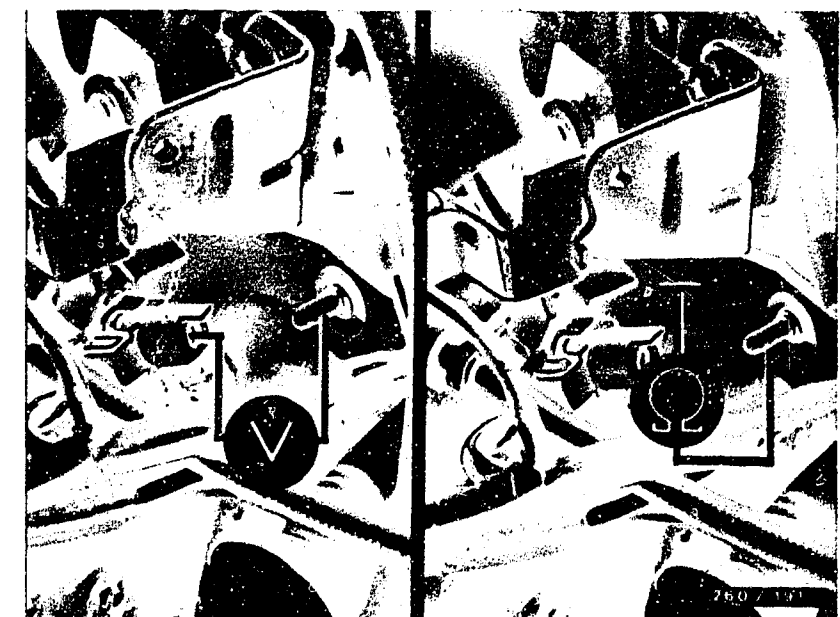
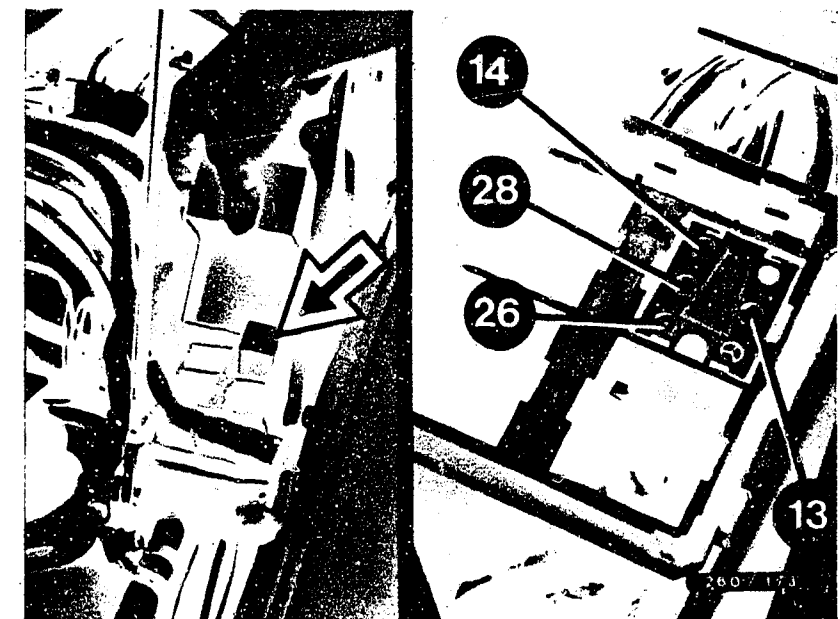
Using ohmmeter, test directly between the plug pins of the bypass-heating element (lower illustration):

Reading: approx. $2.7\ \Omega$
(at approx. $+20^\circ\text{C}$ at bypass-heating element,
temperature-dependent)

Remedying defects:

Eliminate contact resistances, open circuits, and short circuits in leads.

Replace honeycomb heating element. Replace bypass-heating element. Replace relay for intake-manifold pre-heating.



11.8 Testing engine overspeed protection:

To protect the engine, the engine speed is limited to 6200 ± 50 rpm, whereby the supply of fuel is cut off with a valve plate. When the engine speed drops below 6100 rpm the fuel supply is restored.

Switch off ignition; disconnect control-unit plug and connect universal test adapter with Y-adapter cable.

Connect oscilloscope (motortester) special input to universal test adapter (red clip to red test inlet, black clip to black test inlet).

Program switch "V"
in position "14"
Program switch "Ω"
in position "-"

Engine running at operating temperature.

Slowly increase throttle, engine should cut off at approx. 6200 min^{-1} . Choke valve swings fully towards open.

Signal for choke-valve actuator (upper illustration) is reversed. (Bring engine to 6200 min^{-1} only briefly until signal reverses).

Does engine cut off?

Is signal shape reversed?

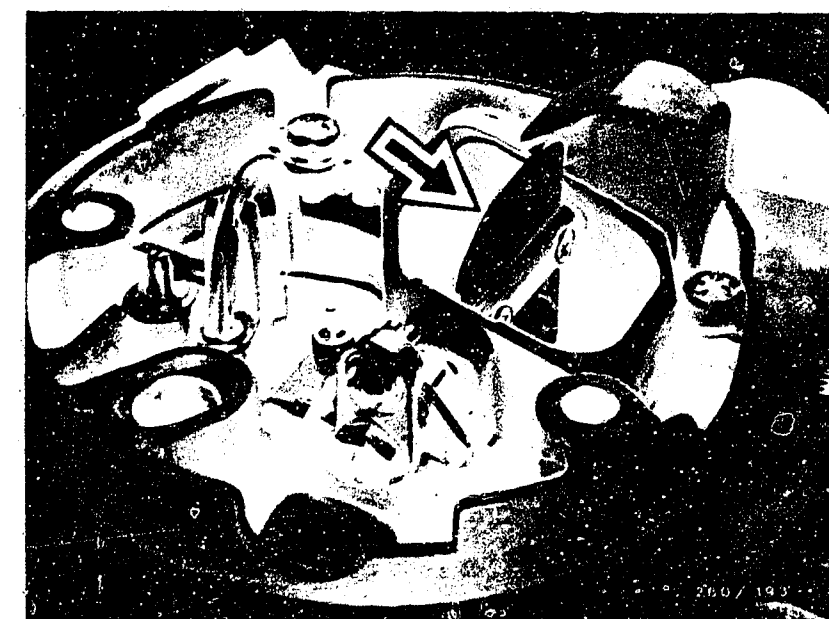
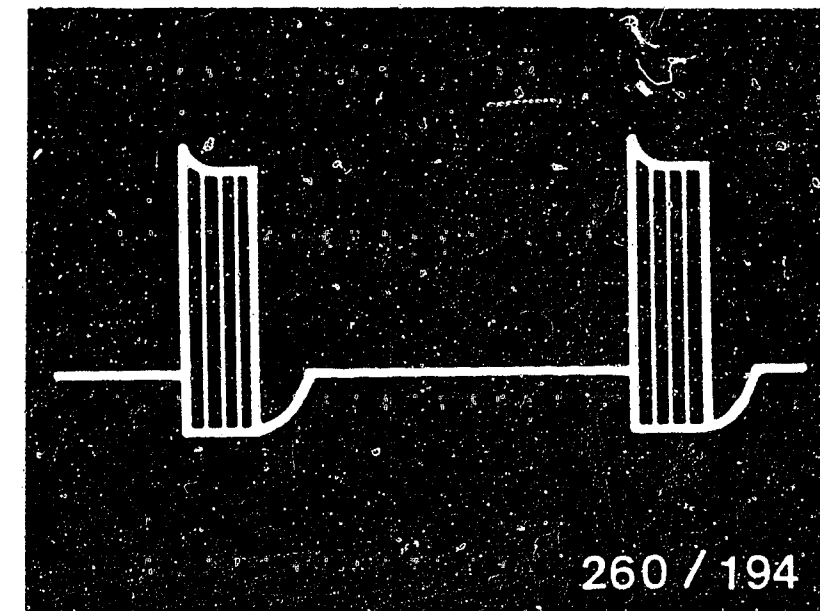
no

1. Signal for choke-valve actuator is not reversed.
Replace control unit.

2. Engine does not cut off: bring engine to approx. 2500 min^{-1} . Disconnect plug from choke-valve actuator and open choke-valve plate to stop by hand and hold there.

Engine should cut off. Does engine fail to cut off?

Check connection rod to valve plate, and if necessary replace valve plate.



F21

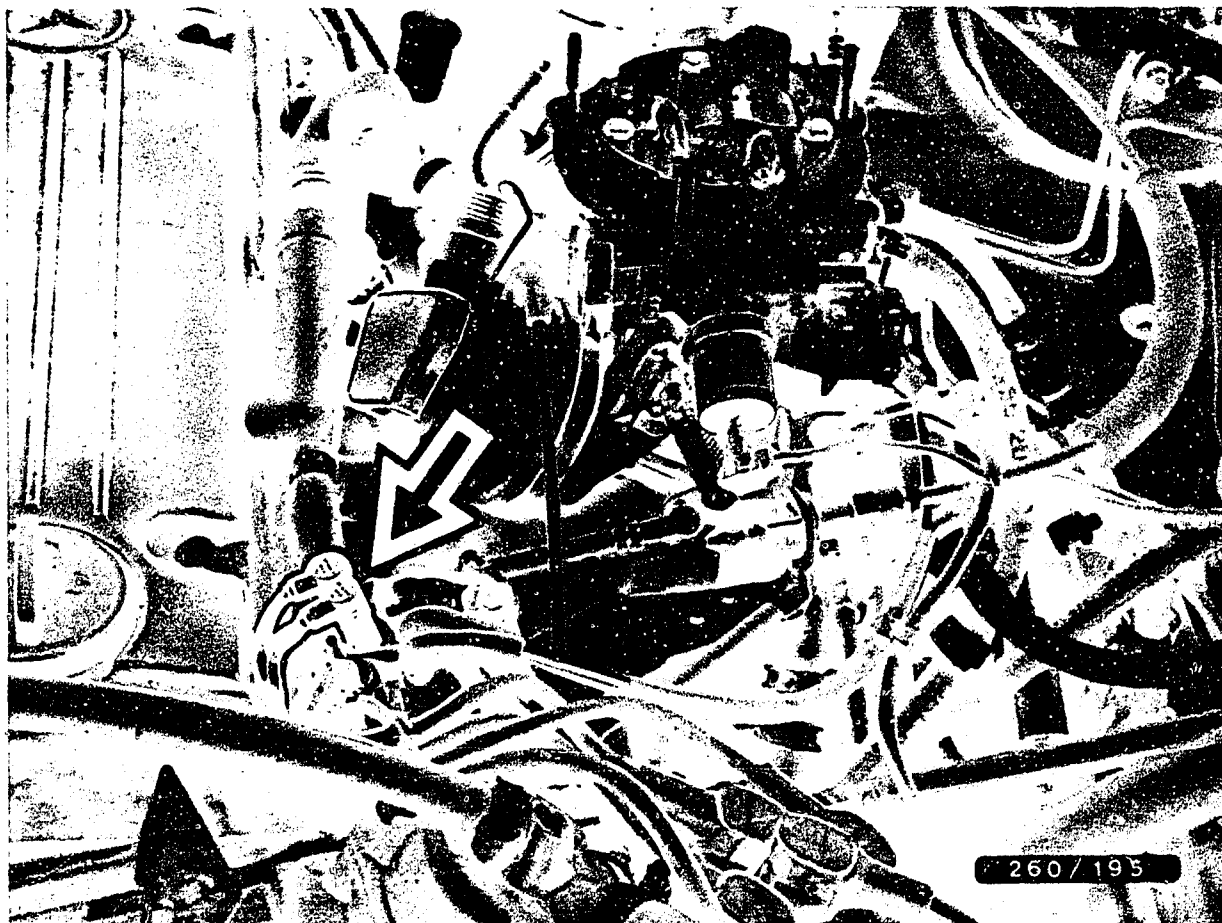
Testing engine overspeed protection
Mercedes-Benz



F22

Testing engine overspeed protection
Mercedes-Benz





11.9 Testing temperature sensor

Disconnect plug from temperature sensor (arrow).

Test resistance at contacts of temperature sensor (plug contact and ground) (resistance depends on temperature).

Nominal value:

At + 20°C	:	2.2 ... 2.8	kΩ
+ 80°C	:	290 ... 364	Ω



11.10 Testing lambda-sensor heating element:

Disconnect plug connection to lambda-sensor heating (upper illustration, 1).

Connect voltmeter to plug coupling (middle illustration) on wiring-harness side.

Switch on ignition.

Reading: $> 10\text{ V}$

Is test specification reached?

no

Trouble-shooting, remedying defects:

Eliminate contact resistances, open circuits, and short circuits in leads.

yes

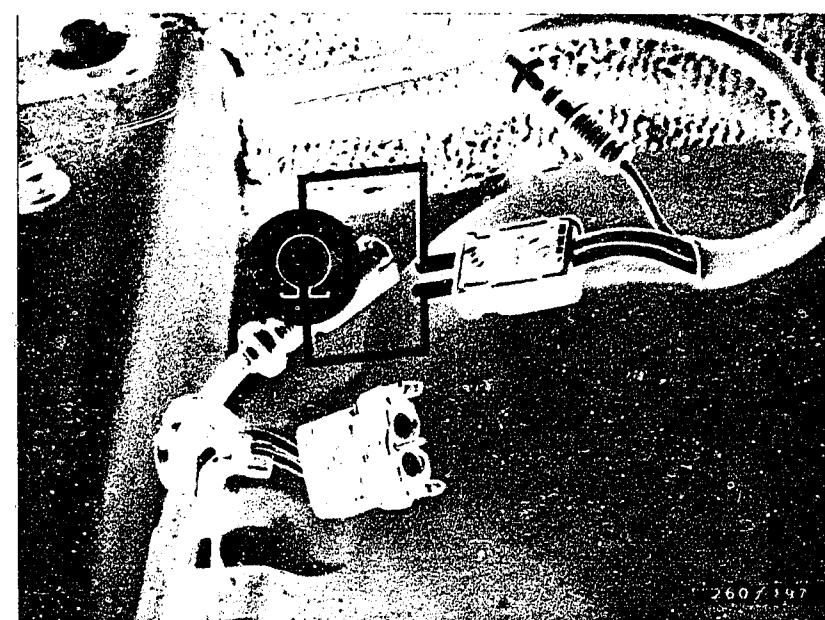
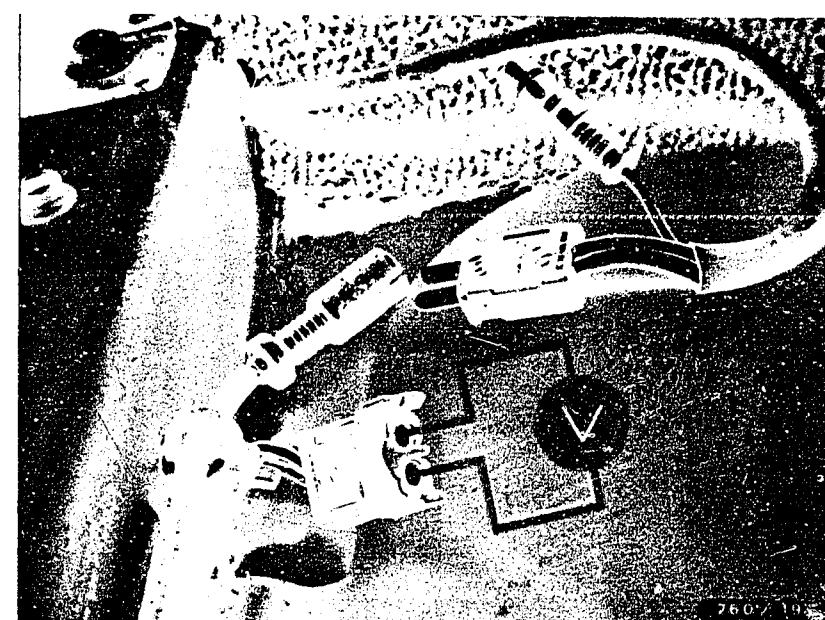
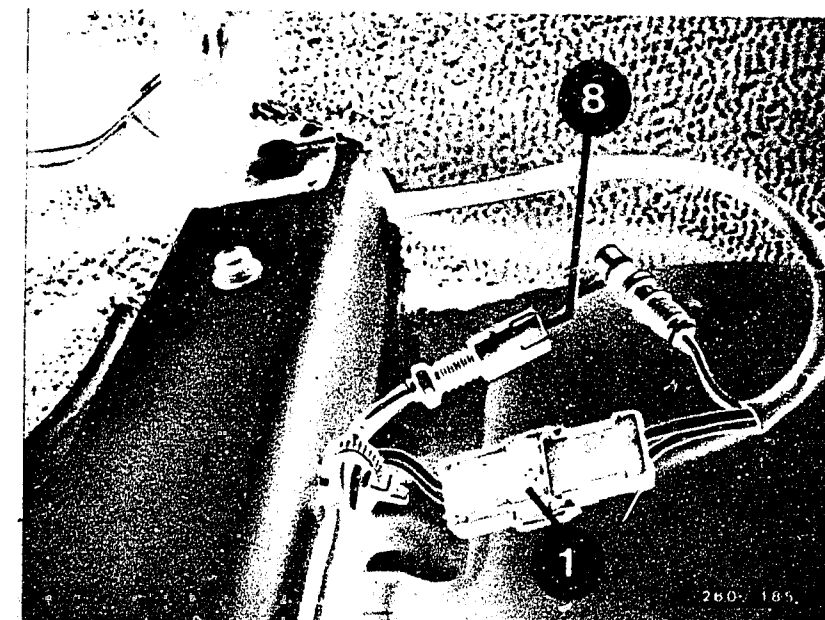
Using ohmmeter, measure directly between the plug pins for lambda-sensor heating:

Reading: at $+20^{\circ}\text{C}$ approx. $4.3\ \Omega$

no

Remedying defects:

Replace lambda sensor.



G1

Testing lambda-sensor heating

Mercedes-Benz



G2

Testing lambda-sensor heating

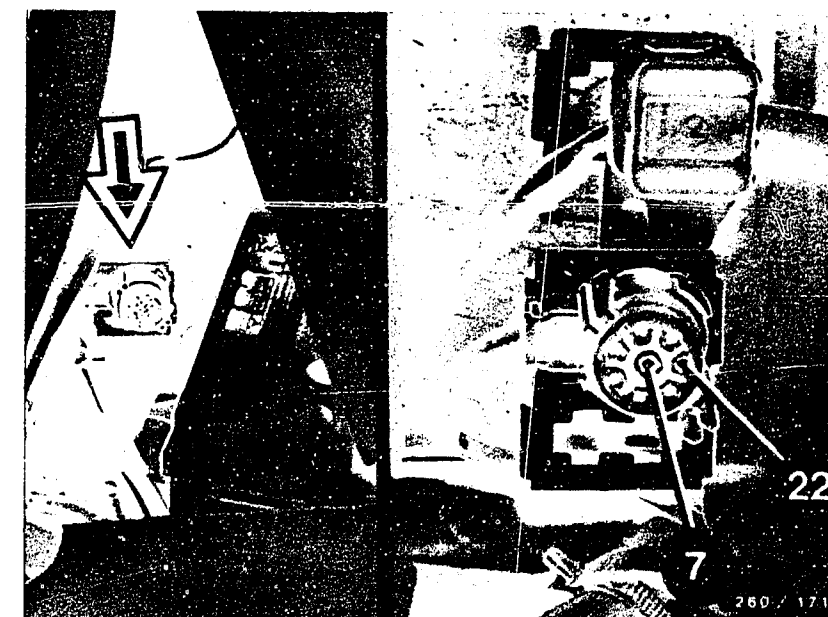
Mercedes-Benz



11.11 Testing adjustment plug for electronic control unit:

Visual check: correct adjustment plug installed (ECE plug for RÜF vehicles, KAT plug for catalytic-converter vehicles). Contacts of adjustment plug not corroded. Adjustment plug lead-sealed! Alter only in case of customer complaint where no defect has been found in system.

KAT	ECE	Position	Function	Complaint
x		1	Basic setting for operation with unleaded premium fuel	-
		2	Basic setting for operation with unleaded regular fuel	-
	x	1 2	Basic setting Leaning of entire characteristic map.	High fuel consumption
x	x	3 - 6	Enrichment of dynamic map	
x	x	3	Enrichment at engine speeds < 2000 rpm and coolant temperatures < 18°C	Poor throttle response at engine speeds < 2000 rpm and coolant temperatures < 18°C
		4	Enrichment over entire engine-speed range and coolant temperatures < 18°C	Poor throttle response over entire engine-speed range at coolant temperatures < 18°C
		5	Enrichment at engine speeds < 2000 rpm over entire temperature range	Poor throttle response at engine speeds < 2000 rpm over entire coolant-temperature range
		6	Enrichment in entire dynamic map	Poor throttle response stage 2 in entire temperature range.
x	x	7	Idle-speed increase by 100 rpm	Idle speed too low



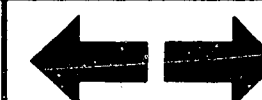
G3

Testing adjustment plug
Mercedes-Benz



G4

Testing adjustment plug
Mercedes-Benz



11.12 Testing idle-speed and CO setting

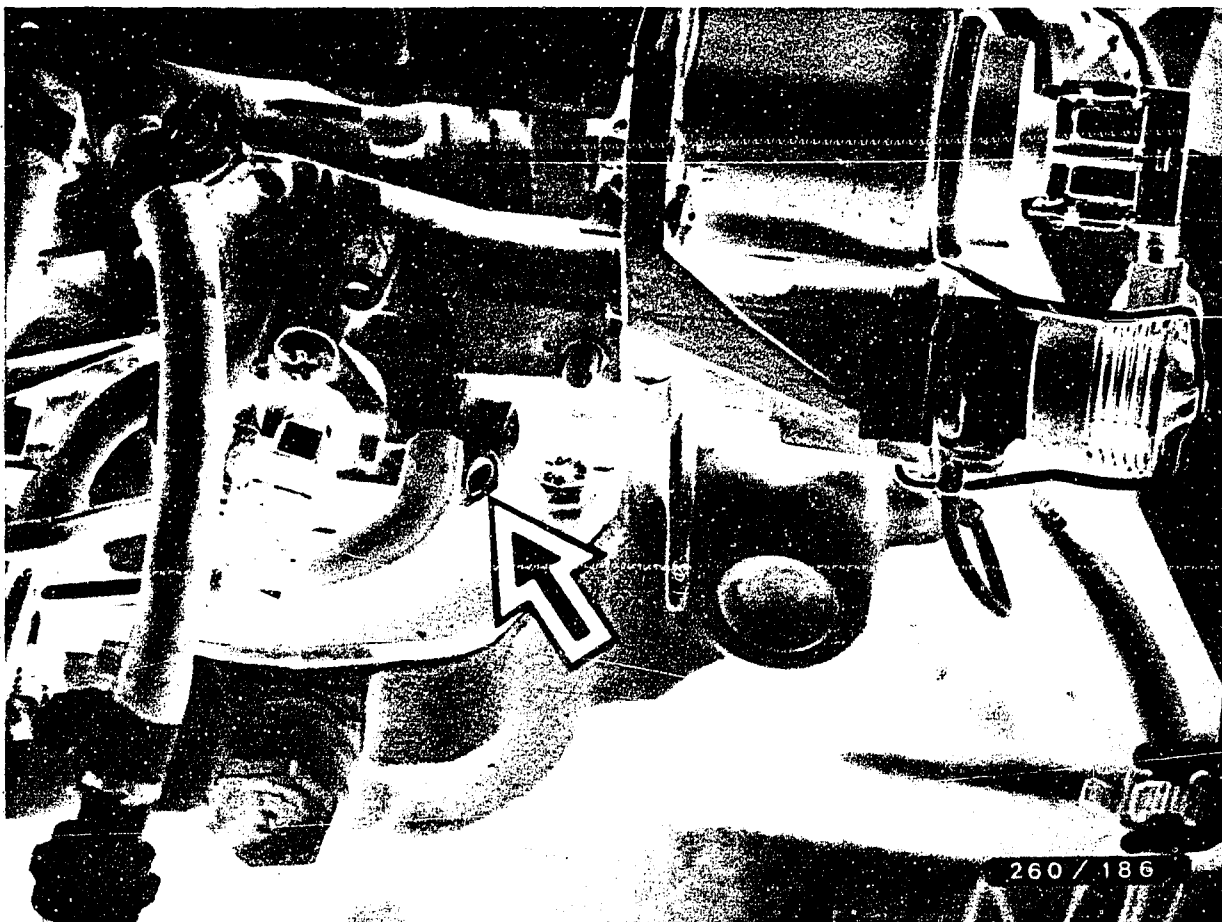
Note:

The idle speed is regulated and cannot be adjusted.

Prerequisites:

- Perfect function of engine
- Ignition system in perfect condition
- Control unit and wiring harness in perfect condition
- Oil temperature approx. + 70°C
- No leakage in induction system, clean air filter installed
- Electrical loads switched off
- Crankcase-ventilation hose disconnected
- Perfect intake-air pre-heating functioning
- Accelerator actuation in perfect working order
- Exhaust system in good shape
- Tachometer in CO tester connected (only on vehicles without lambda closed-loop control)
- Lambda sensor OK





● CO adjustment (vehicles without lambda closed-loop control)

Exhaust test with CO tester with engine at operating temperature and running at idle speed.

Adjust CO content using idle-mixture-adjusting screw (arrow).

First increase above nominal value and then adjust down by screwing in.

Idle speed:
on vehicles with

5- or 4-speed automatic
transmission

$740 \pm 40 \text{ min}^{-1}$

CO setting:

$1.0 \pm 0.5 \text{ vol. } \%$

• CO adjustment (vehicles with lambda closed-loop control) (without universal test adapter)

The CO content in the exhaust is indirectly set via the integrator voltage of the lambda closed-loop control

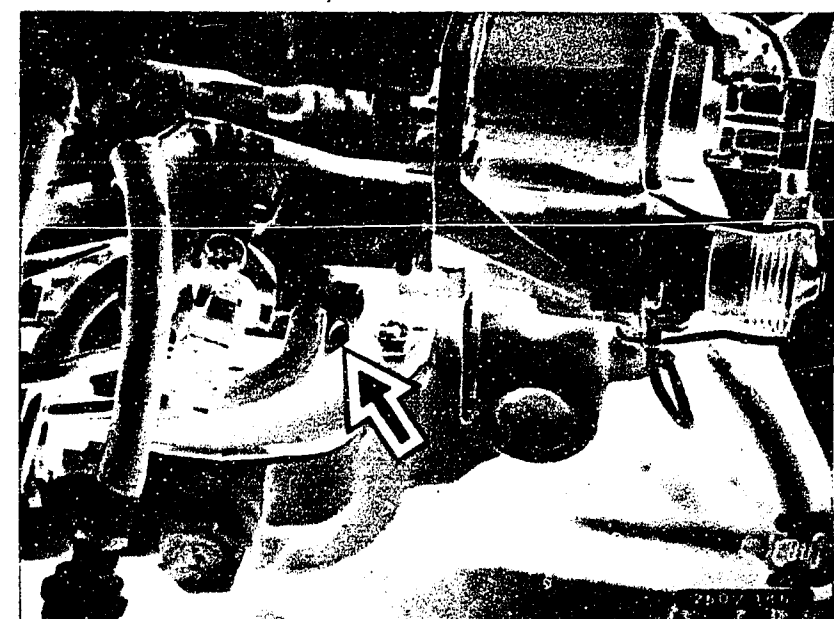
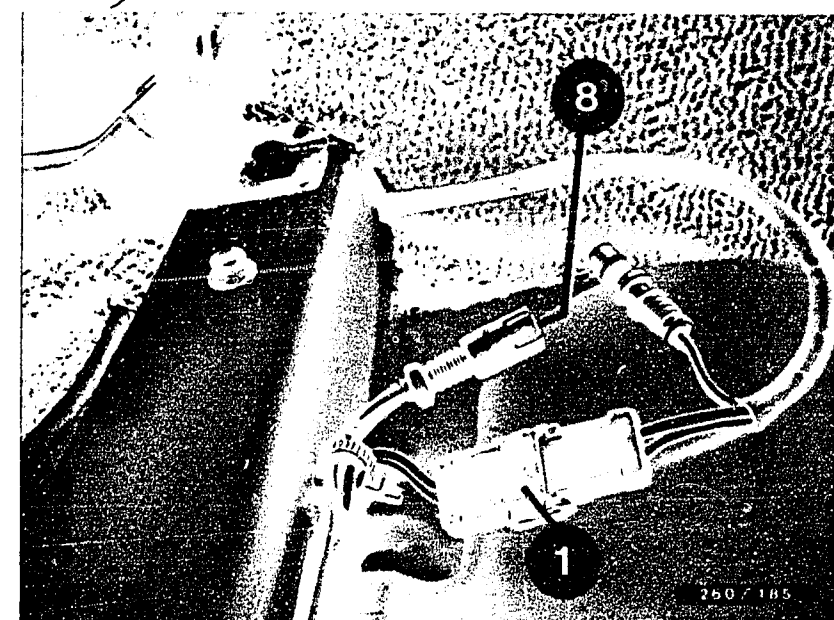
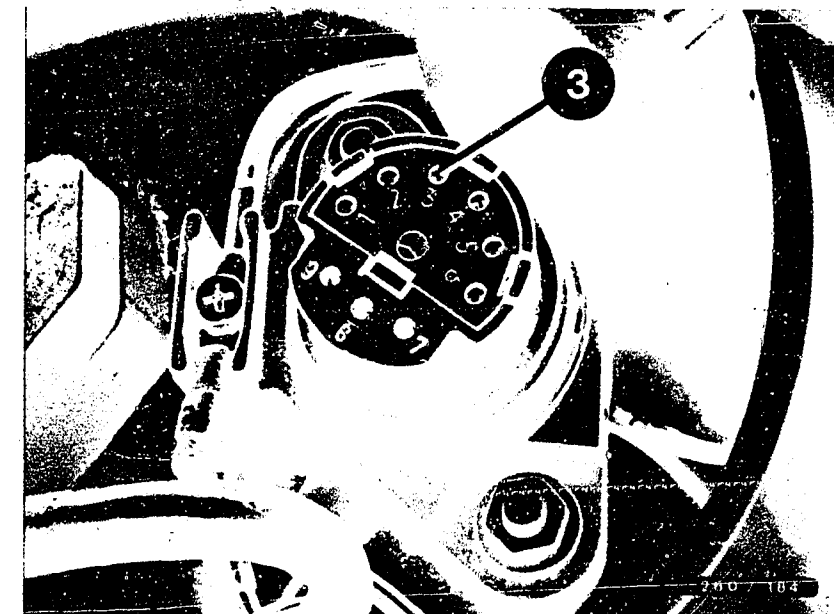
Connect voltmeter (analog tester) or lambda closed-loop control tester to the diagnostic socket (upper illustration) pin 3 (+) and to ground (use suitable test lead).

Disconnect lambda-sensor plug coupling (middle illustration, 1). Read voltage at tester and note down (reading between 5 ... 7 V, or 50 % on-off ratio), open-loop control value of lambda closed-loop control.

Re-connect lambda-sensor plug coupling. Allow engine to run for approx. 30 sec. at a speed of 3000 min⁻¹ to assure proper functioning of the lambda sensor. Read integrator voltage at tester. The measured value oscillates (± 0.5 V, or ± 10 % on-off ratio) about the previously-determined open-loop control value for the lambda closed-loop control.

If the reading at the tester oscillates by a smaller amount (or with the lambda closed-loop control tester by a larger amount), the basic setting is too lean. Screw idle-mixture-adjusting screw (lower illustration, arrow) out and back in. Adjust in small increments.

After each increment check the voltage reading.



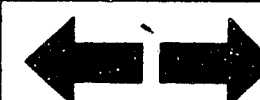
G7

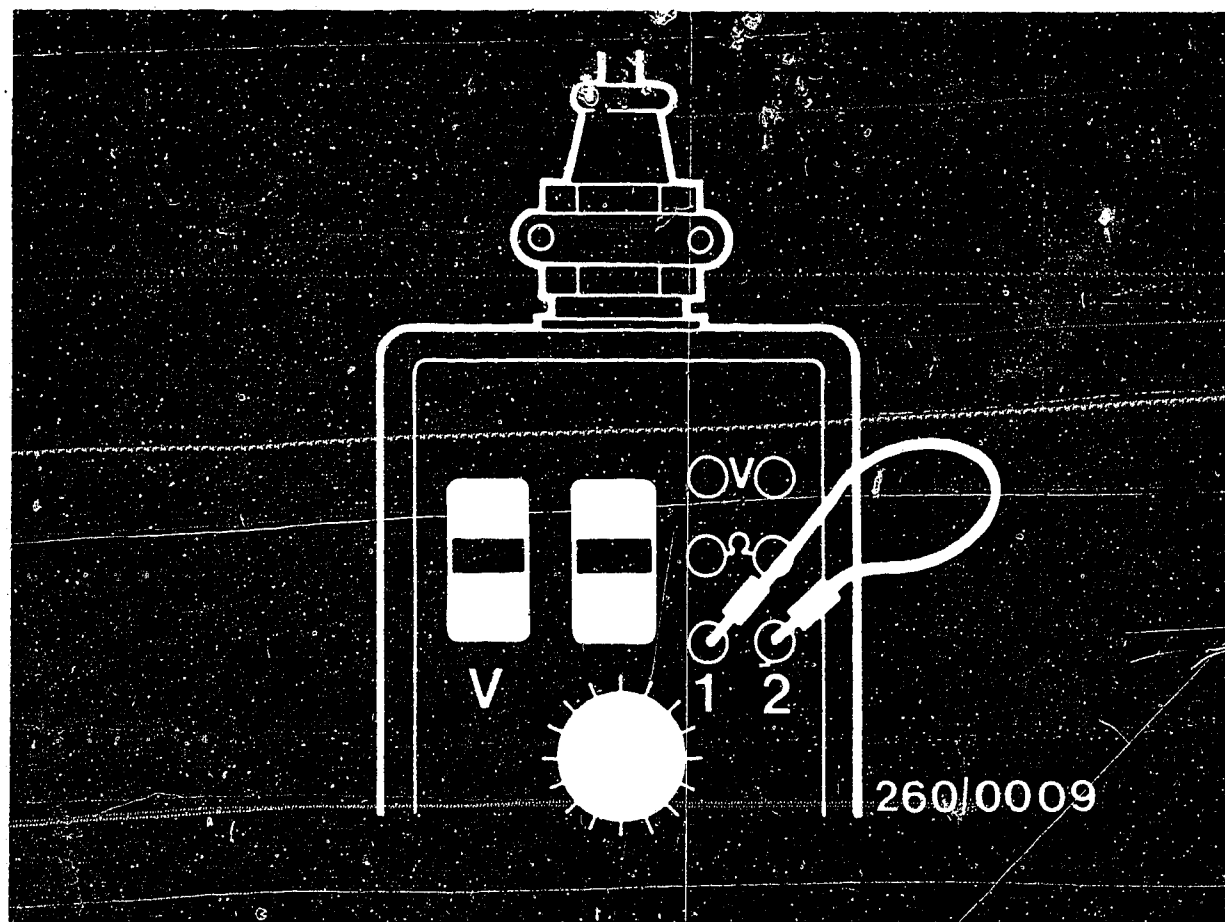
CO adjustment
Mercedes-Benz



G8

CO adjustment
Mercedes-Benz





11.13 Testing accelerator actuation

Bring throttle plate into overrun position as follows:

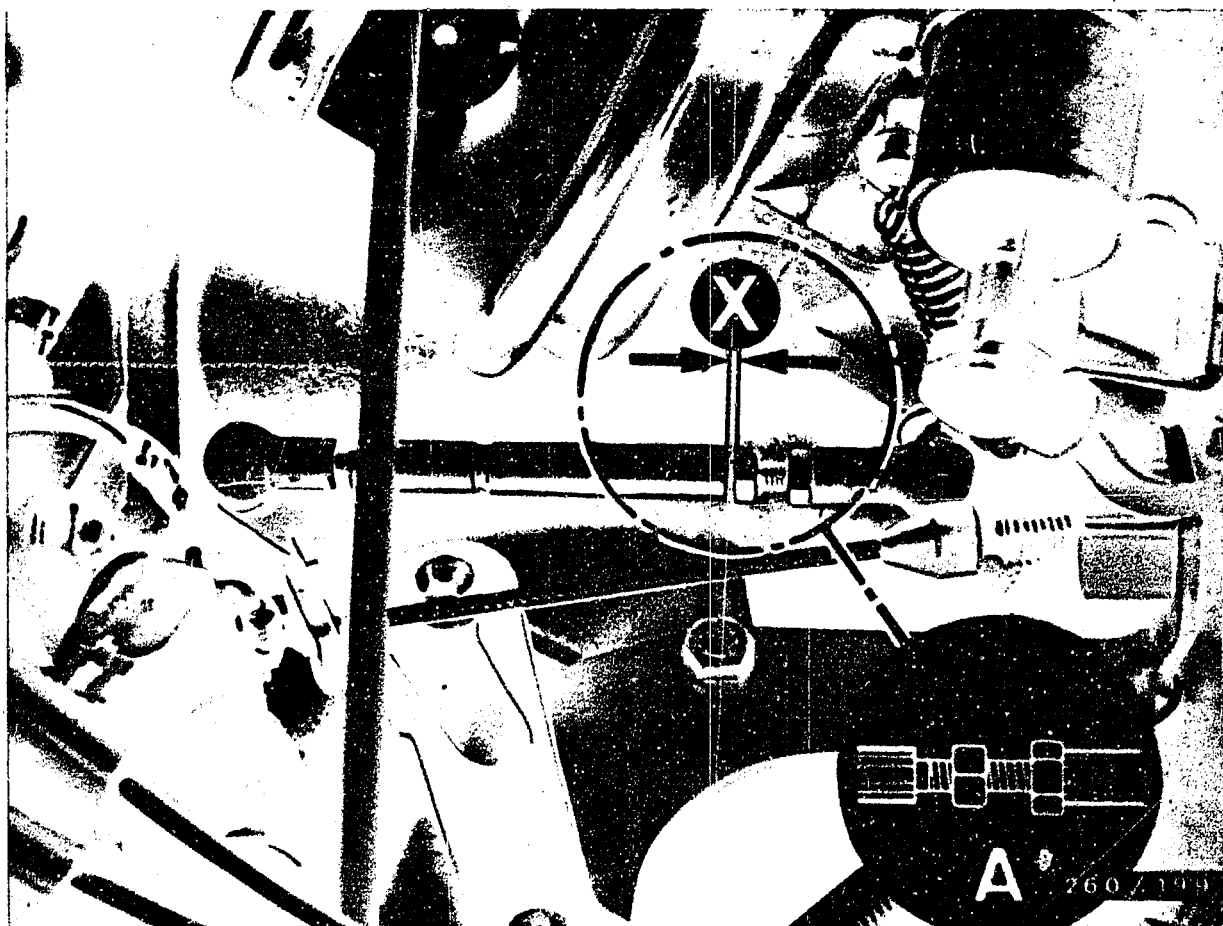
- With universal test adapter connected

Remove jumper at jacks 1/2.

Press button T4 → engine cuts off.

The tappet of the throttle-valve positioner is thereby pulled all the way back.





● Without universal test adapter:

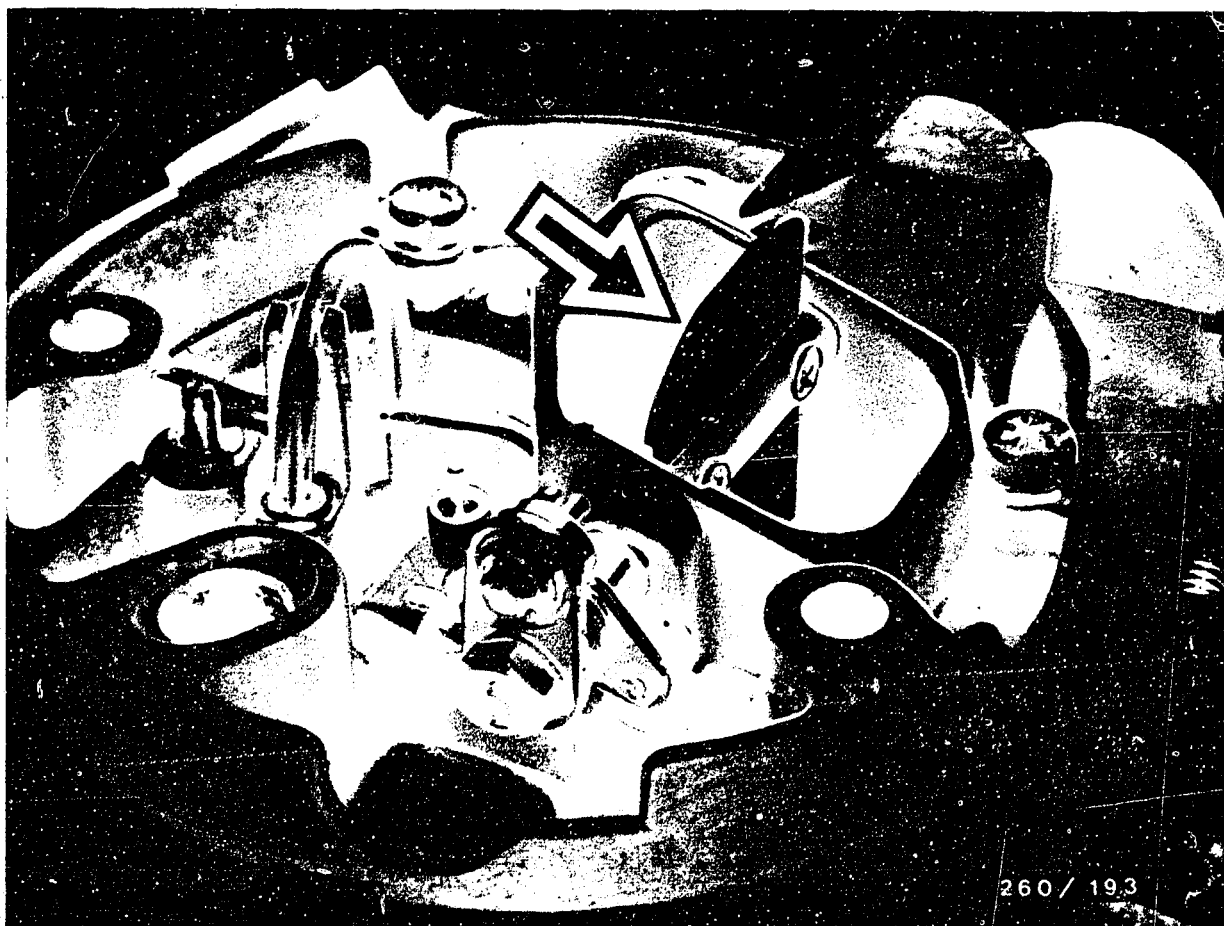
Let engine idle.

Seal ventilating side of throttle-valve positioner and switch off ignition. The tappet of the throttle-valve positioner is thereby pulled all the way back (overrun position).

Check to see whether throttle-valve stop screw is at the stop.

Set throttle linkage so that there is a clearance $x = 0.1 \dots 0.5 \text{ mm}$.

Check to see if full-load position is reached.



11.14 Testing choke-valve plate, choke-valve actuator, idle-air correction needle for freedom of movement

Unscrew and remove air filter.

Ignition switched off.

Close choke-valve plate (arrow) by hand, while making sure that idle-air correction needle does not catch. Choke-valve plate should re-open all the way automatically.

G11

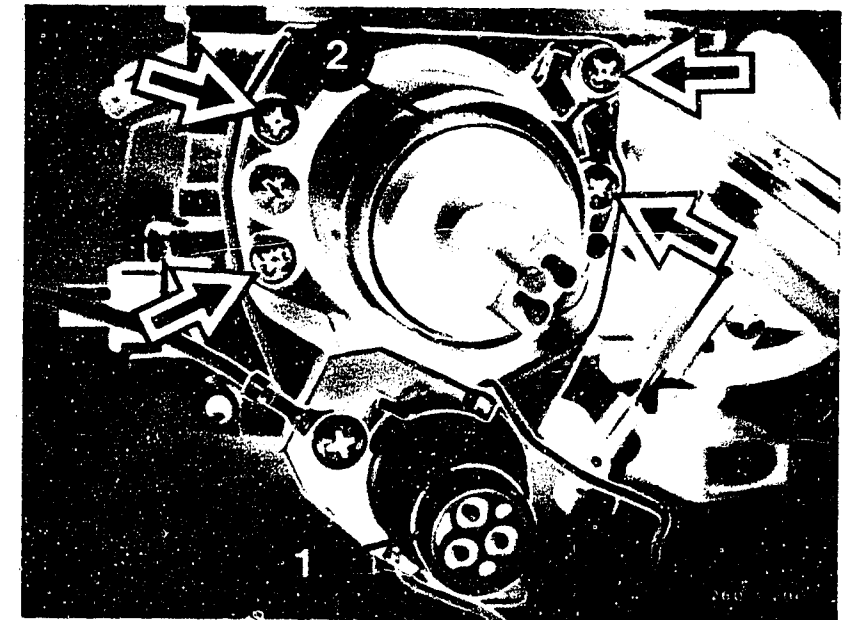
Choke-valve plate, idle-air correc. needle
Mercedes-Benz



- Idle-air correction needle stiff/catches

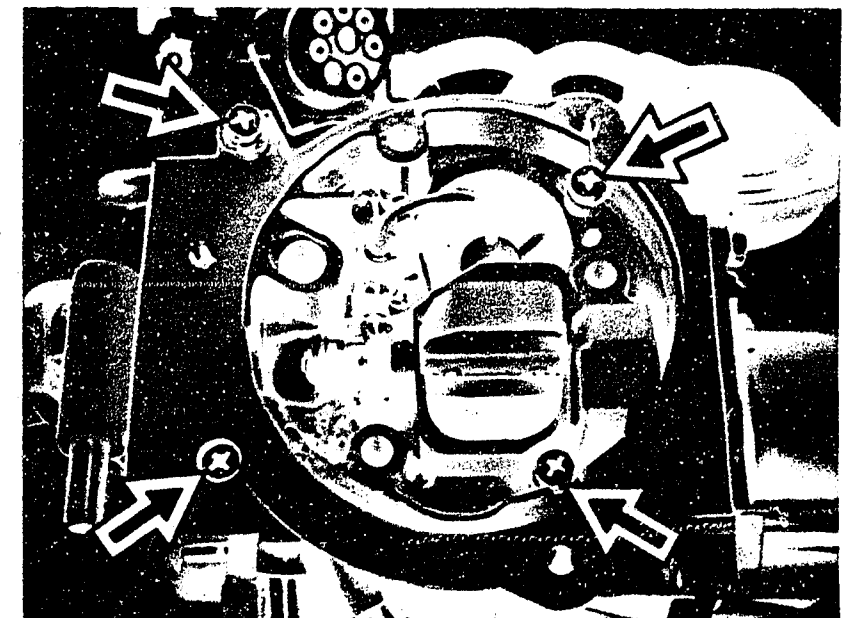
Clean upper section of carburetor.

- Remove throttle-valve potentiometer (upper illustration 1) (be careful that coupling does not fall out).
- Remove holder with choke-valve actuator (upper illustration 2) by removing 4 fastening screws (upper illustration, arrows).



- Unscrew fastening screws for upper section of carburetor (lower illustration, arrows)
- Lift off upper section of carburetor.

When re-assembling, use new seals.



G 12

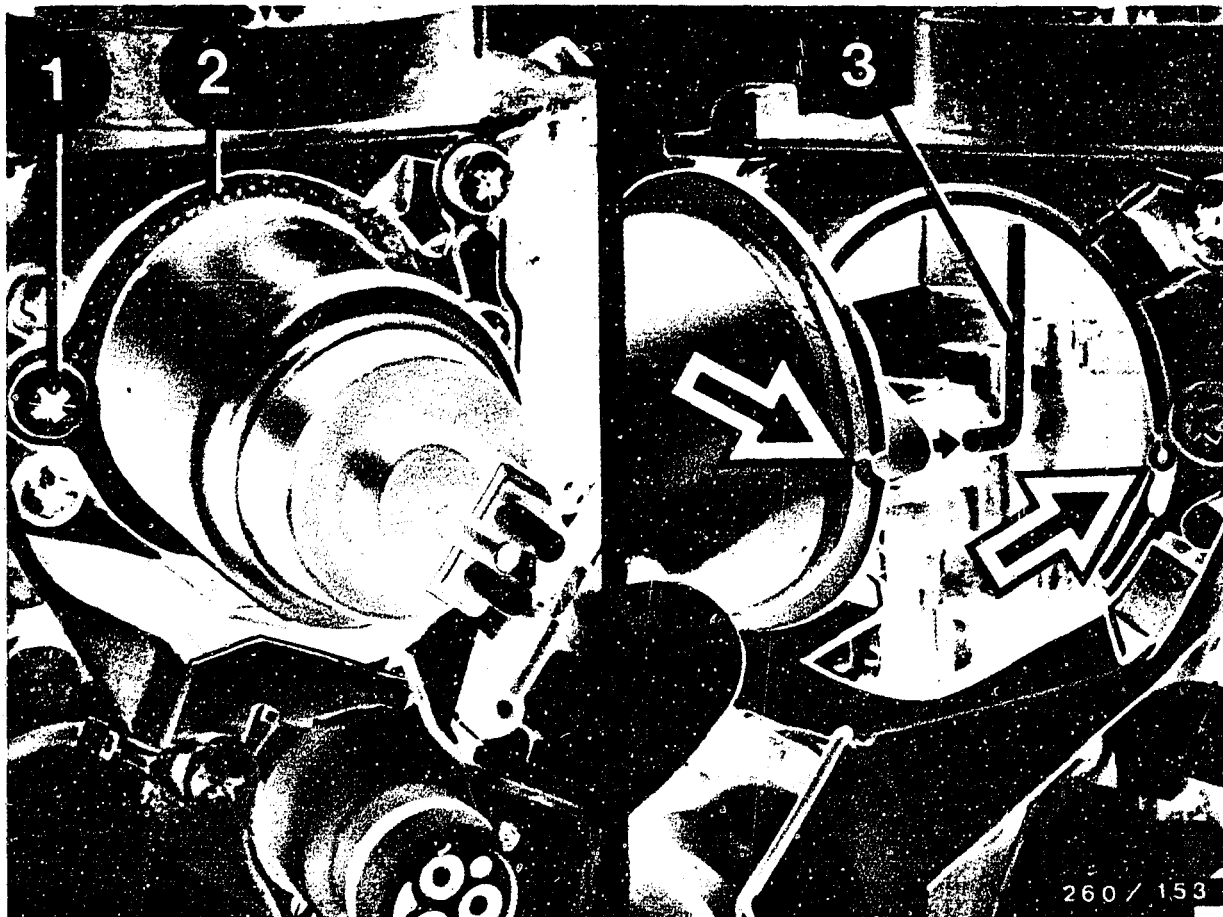
Choke-valve plate, idle-air correc.needle
Mercedes-Benz



G 13

Choke-valve plate, idle-air correc. needle
Mercedes-Benz





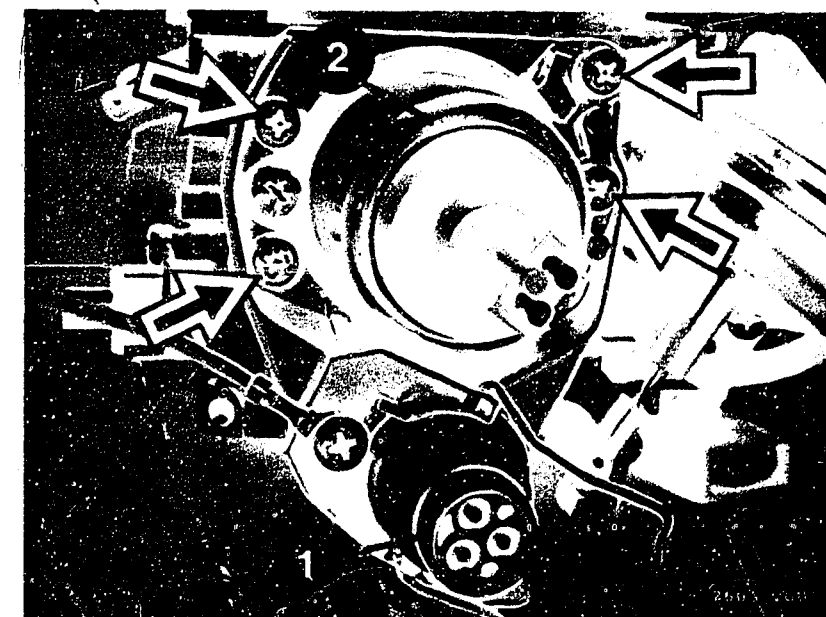
● Choke-valve plate stiff:

- Replace choke-valve actuator if stiff: unscrew fastening screw (1), turn clamping ring (2), and remove choke-valve actuator.
- Make linkage rod (3) to choke-valve plate easily movable (e.g. with WD 40 or Unispray "Termal"). Under no circumstances bend linkage rod!
- When installing the choke-valve actuator, pay attention to its detent (arrows), as well as to the linkage rod (3) to the choke-valve plate.



11.15 Float (level), inspecting float needle
Remove carburetor upper section.

- Remove throttle-valve potentiometer (upper illustration, 1).
- Remove holder with choke-valve actuator (upper illustration, 2) by unscrewing 4 fastening screws (upper illustration, arrows).



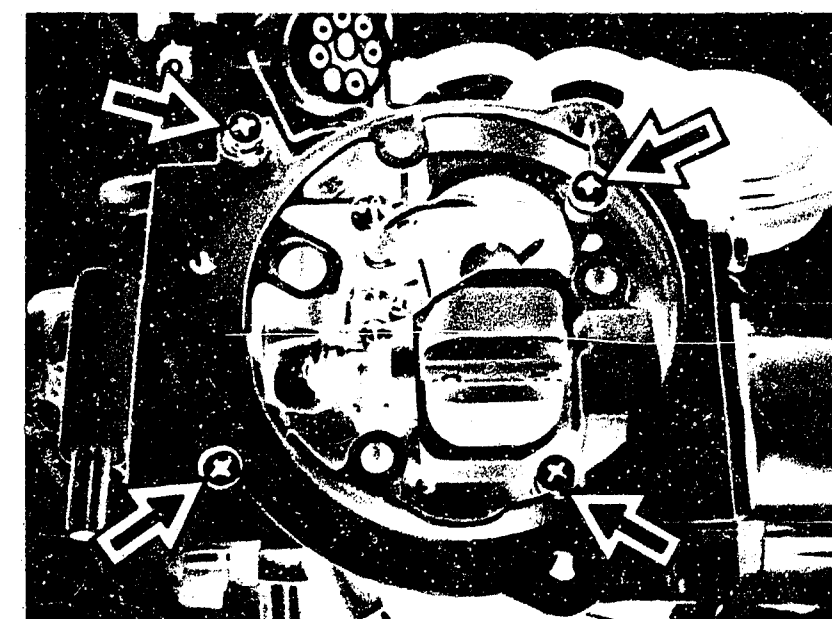
- Unscrew fastening screws (lower illustration, arrows).

- Lift off upper section of carburetor.

- Inspecting float (fuel level)

The fuel level cannot be adjusted; the correct fuel level is obtained by using a float in good condition.

Float weight: 7.9 ± 0.5 g



G 15

Float level, checking float needle
Mercedes-Benz



G 16

Float level, checking float needle
Mercedes-Benz



- Checking float needle:

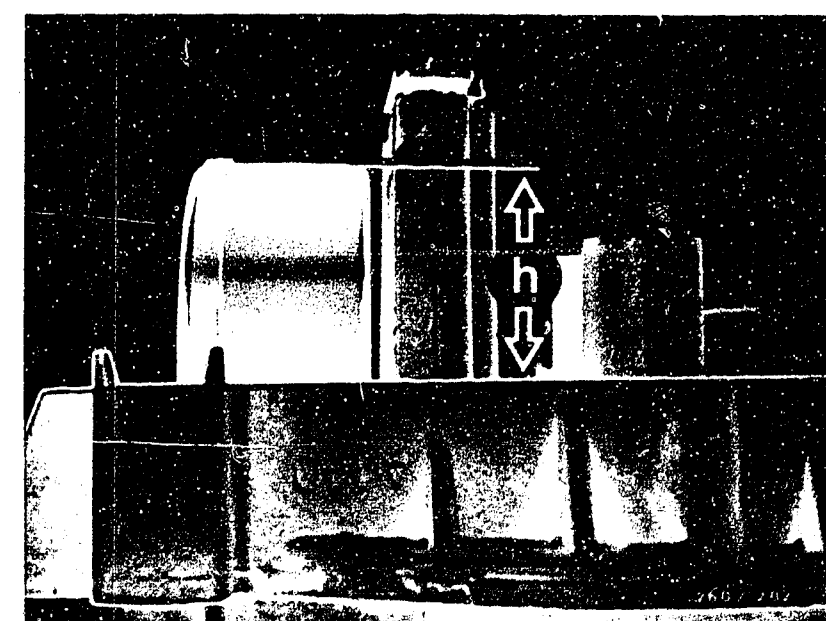
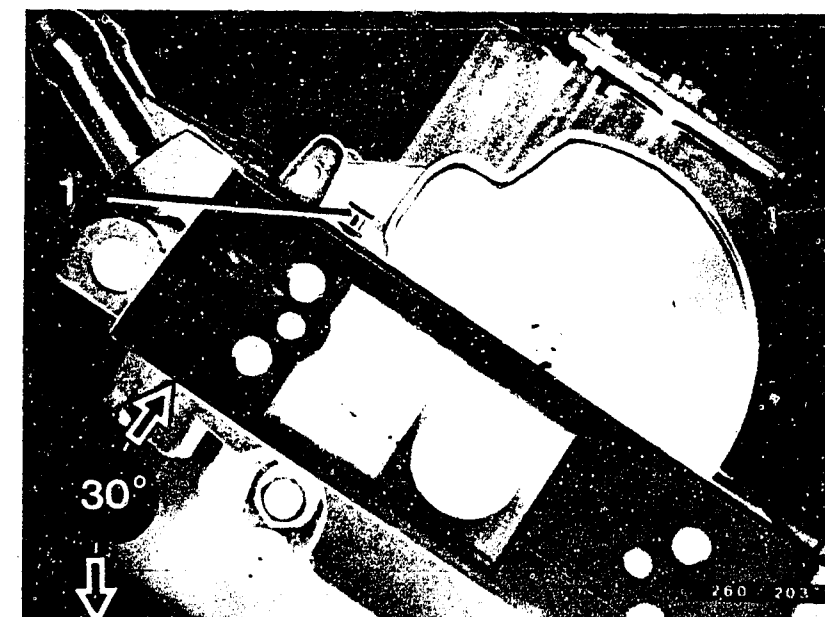
Move float and check whether float needle is operable.
If necessary replace float needle.

- Checking float level:

Set carburetor upper section down at approx. 30° tilt (upper illustration).
The valve pin (1) of the float needle must not spring in due to the weight of the float during testing.

Height "h" : 27.5 ± 1.0 mm (lower illustration)

Check whether float needle valve is correctly seated.



G17

Checking float needle, float level
Mercedes-Benz



G18

Checking float needle, float level
Mercedes-Benz



11.16 Checking nozzles

Remove carburetor upper section:

Remove throttle-valve potentiometer (1 Phillips-head screw), making sure that coupling does not fall out.

Remove holder with choke-valve actuator (4 Phillips-head screws). Remove carburetor upper section (5 Phillips-head screws).

Carburetor nozzles

Stage	1st stage	2nd stage
Main nozzle	x 110	x 135
Air-correction nozzle (with mixing tube)	92.5	70
Idle fuel nozzle	x 50	---
Off-idle nozzle	---	70
Nozzle needle idle- air correction	5	---



11.17 Inspecting throttle shaft for excessive play

If throttle plate is worn remove and dismantle carburetor.

Replace float-chamber housing.

11.18 Adjusting throttle-valve positioner:

Switch on ignition.

Connect vacuum pump to evacuating valve (upper illustration) and generate a constant differential pressure (approx. 250 mbar) during the adjustment procedure (tappet of throttle-valve positioner moves into position thus determined).

In this position the feeler gauge (2.0 ± 0.05 mm) should slide between the throttle-valve stop screw and the stop (lower illustration, 1 and 2).

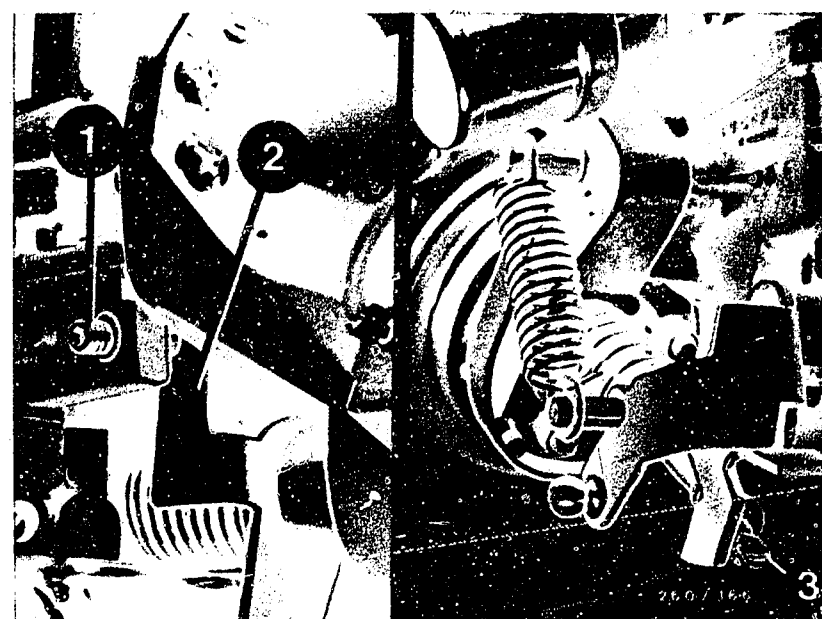
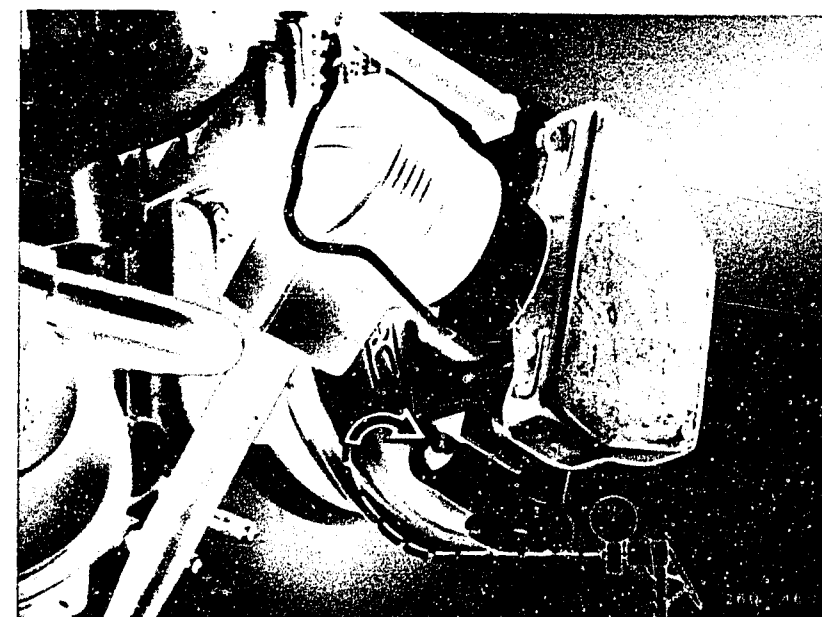
Note: The throttle-valve stop screw must not be moved.

Adjust on idle stop screw (lower illustration, 3).

Break off head of idle stop screw.

Restore hose connections.
Test idle.

Switch off ignition.



G20

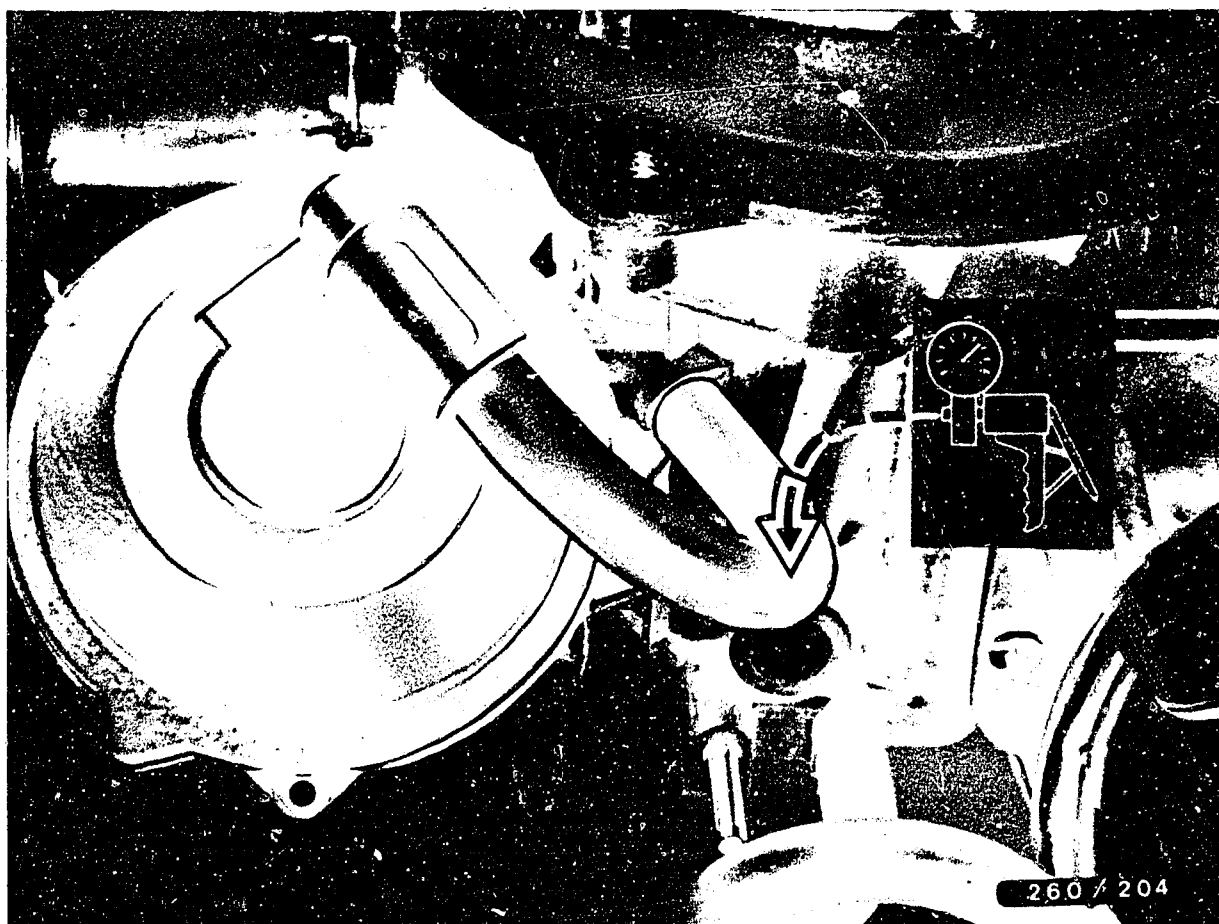
Checking throttle shaft, setting TVP
Mercedes-Benz



G21

Checking throttle shaft, setting TVP
Mercedes-Benz





11.19 Inspecting stage II vacuum unit

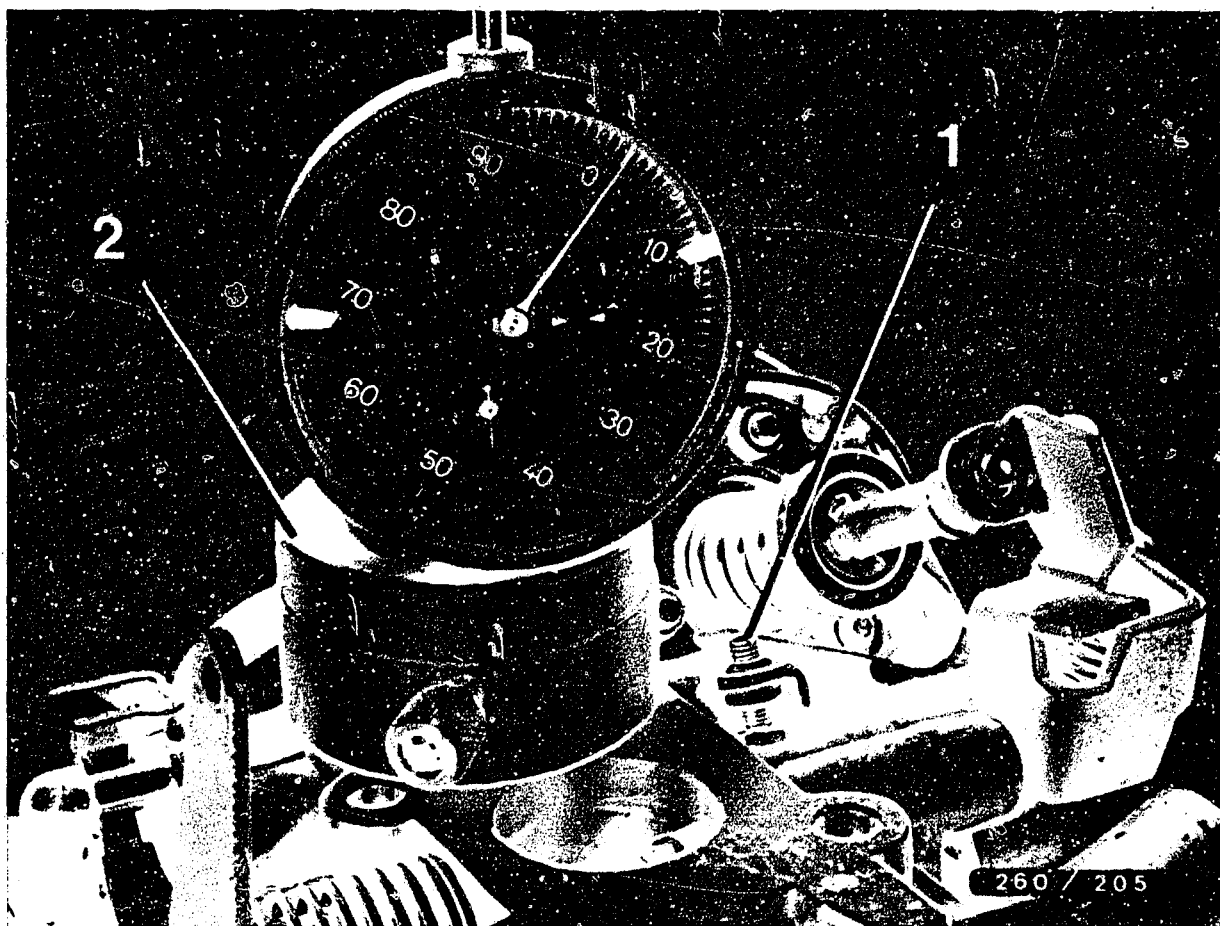
Inspecting vacuum unit:

Check vacuum port on carburetor for flow-through.

Inspect connecting hoses.

Connect vacuum pump and generate a differential pressure of approx. 300 mbar.

If a drop in the differential pressure can be determined, replace the vacuum unit.



11.20 Inspecting basic setting, stage II

Remove air filter.

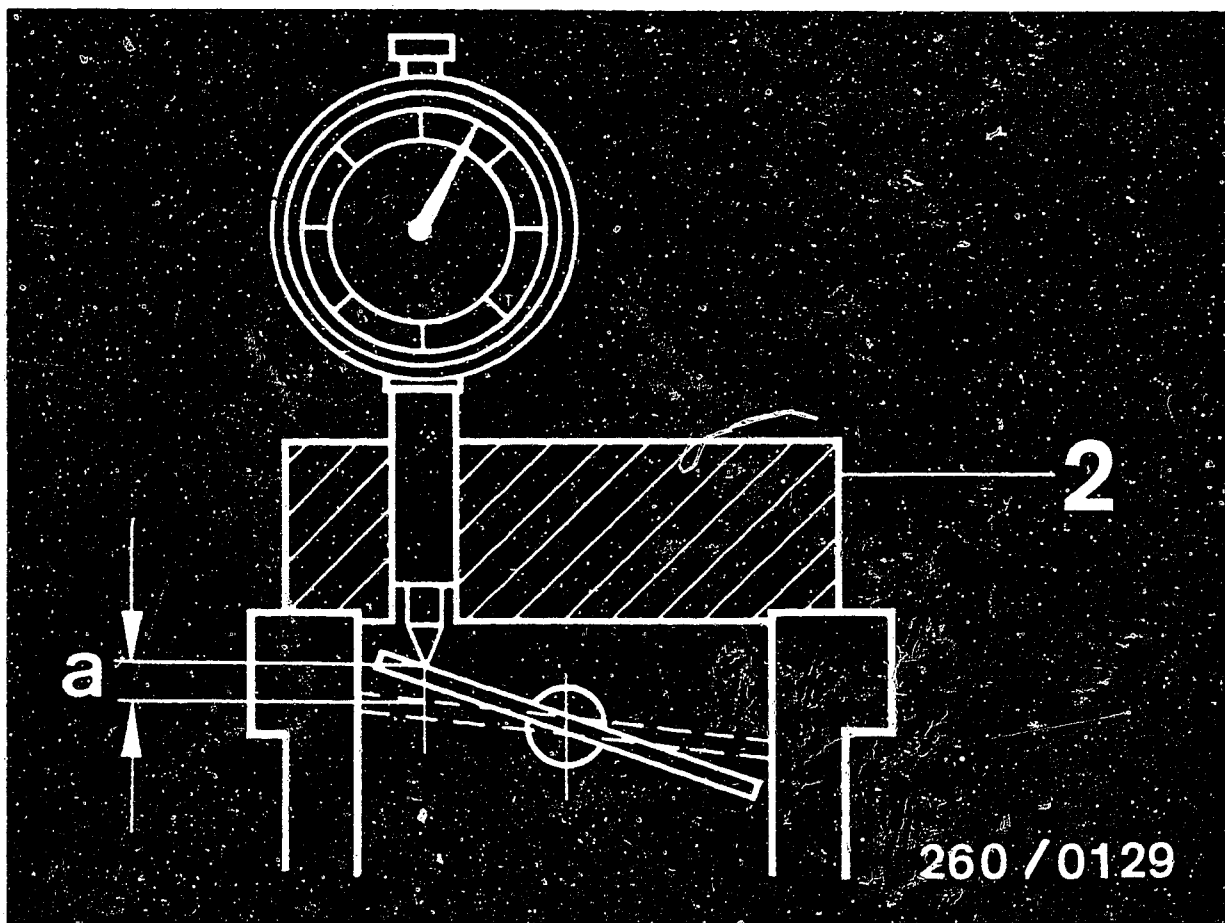
Disconnect all plugs as well as hose connection, if necessary, from carburetor.

Remove carburetor.

Screw throttle-valve stop screw (1) out until it no longer contacts the stop.

Lightly press throttle-plate lever towards closing.

Set measuring device (2) (measuring adapter no. 4) in position.

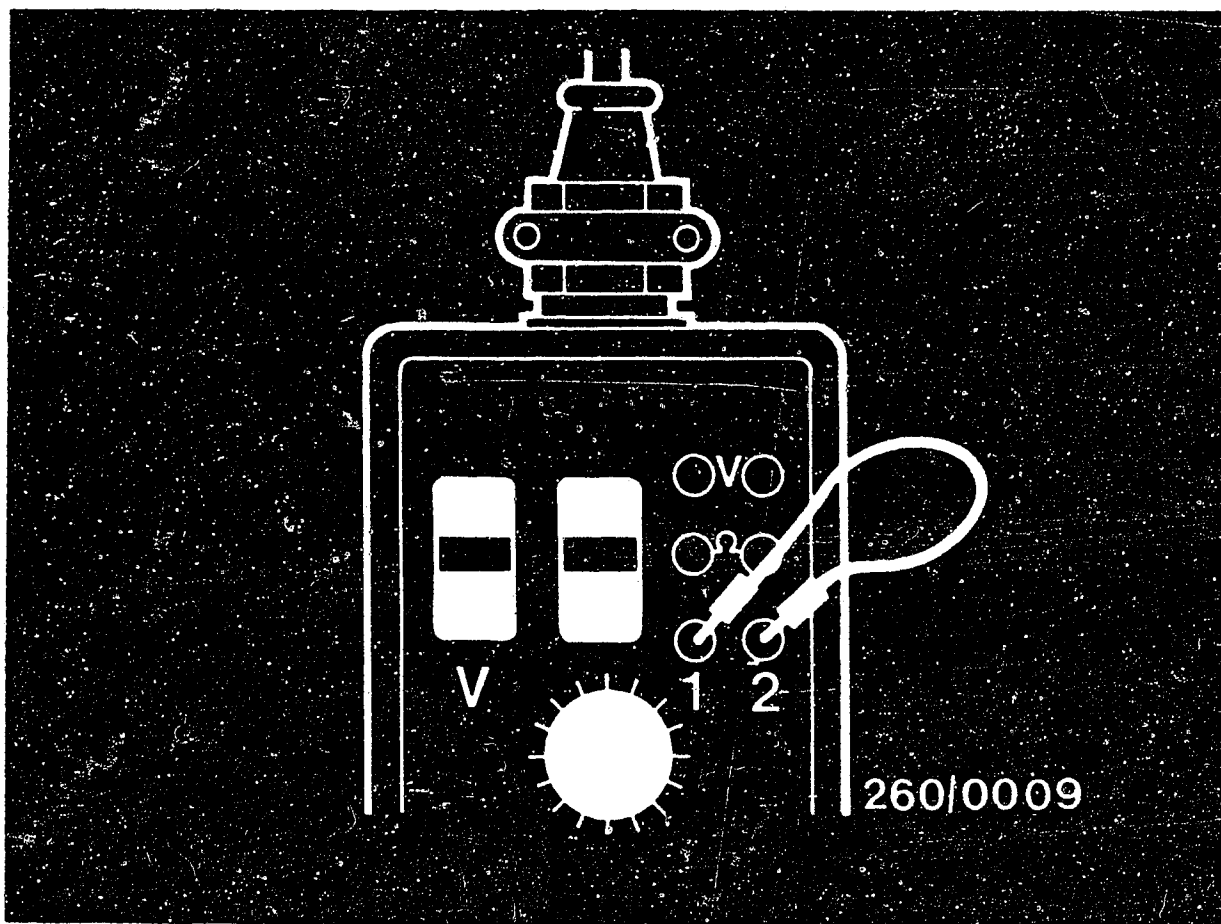


Determine the highest point of the throttle plate by turning the measuring adapter (2).

Set dial indicator to "0".

Set dimension "a" with throttle-valve stop screw.

$$\underline{a = 0.02 \pm 0.02 \text{ mm}}$$



11.21 Testing stage II release and positive return

To do this, bring throttle plate into overrun position as follows:

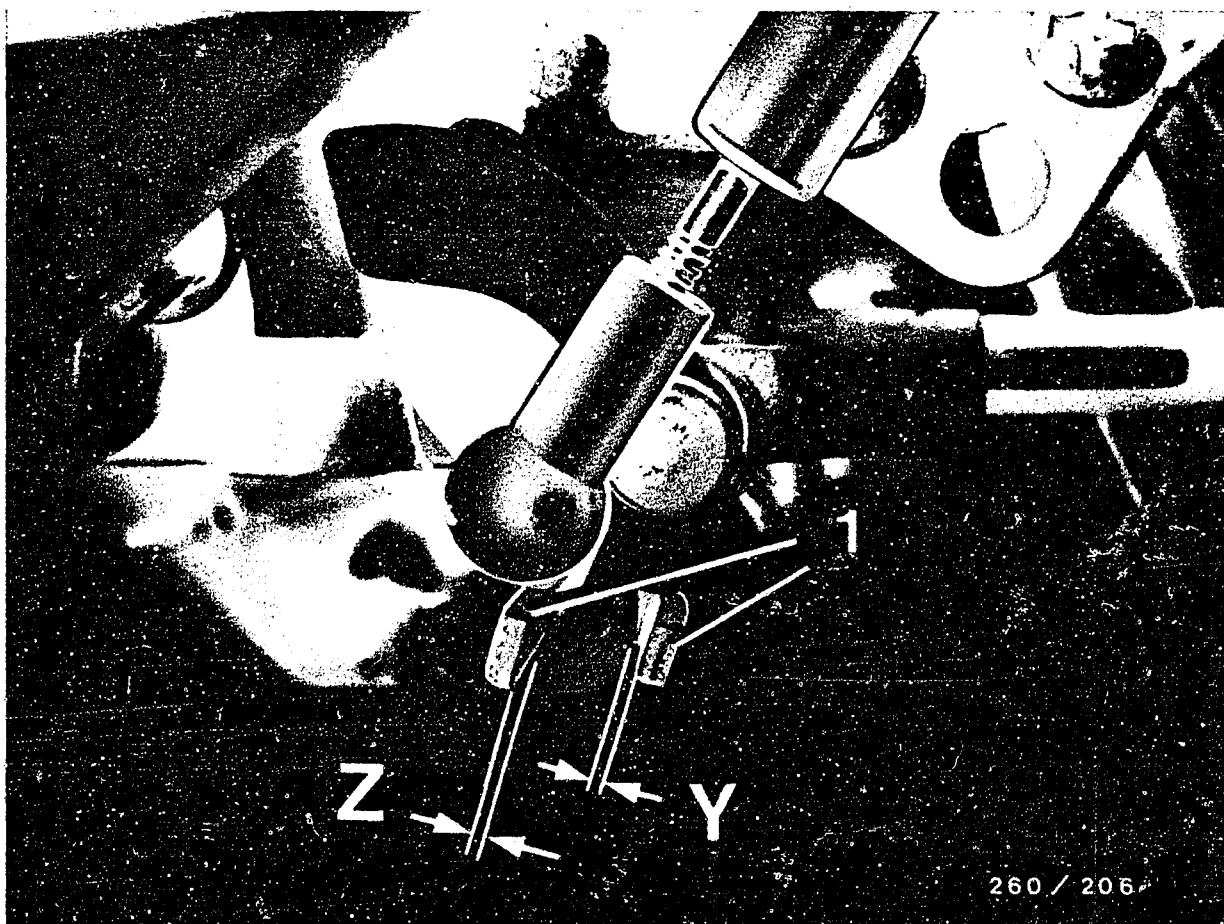
With universal test adapter connected:

Remove bridge between jacks 1 and 2 and let engine idle; press button T4 on universal test adapter. This causes the tappet of the throttle-valve positioner to be pulled all the way back.

Without universal test adapter:

Let engine idle. Seal ventilating side of throttle-valve positioner (arrow) and switch off ignition. This causes the tappet of the throttle-valve positioner to be pulled all the way back (overrun position).

Check to see if throttle-valve stop screw is against the stop.



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Note:

If necessary, remove air filter and carburetor to permit easier working.

Set dimensions "Y" and "Z" by bending the fork (1). Carry out measurement at the narrowest point:

$$Y = 0.8 \pm 0.3 \text{ mm}$$

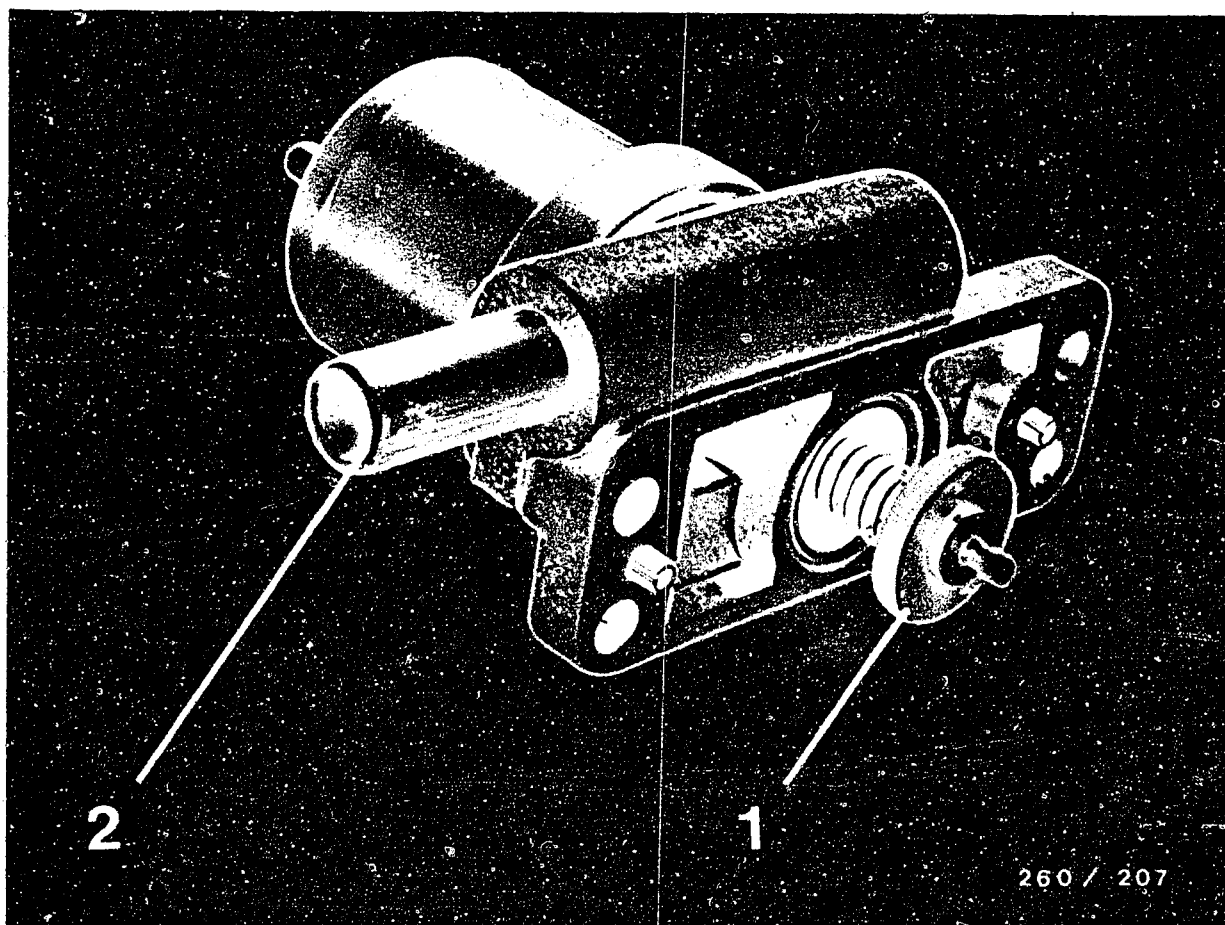
$$Z = 0.4 \pm 0.2 \text{ mm}$$

Turning torque for carburetor fastening: 7 Nm

H3

Stage II release and positive return
Mercedes-Benz





11.22 Electrical float-chamber change-over ventilation valve

- Switch on ignition and test supply voltage (min. 11.5 V).
- Unscrew float-chamber change-over ventilation valve and apply voltage (12 V). This pulls the valve plate (1) to its seat and blocks the channel (2).

11.23 Corrosion/dirt in carburetor

Remove all plugs, and hose connections, if necessary, from carburetor.

Remove carburetor.

Take out throttle-valve potentiometer (upper illustration, 1), making sure that coupling does not fall out.

Take out choke-valve actuator (2) with holder (upper illustration) by unscrewing 4 fastening screws (upper illustration, arrows).

Unscrew fastening screws for carburetor upper section (lower illustration, arrows).
Remove upper section of carburetor.

Unscrew remaining electrical components.

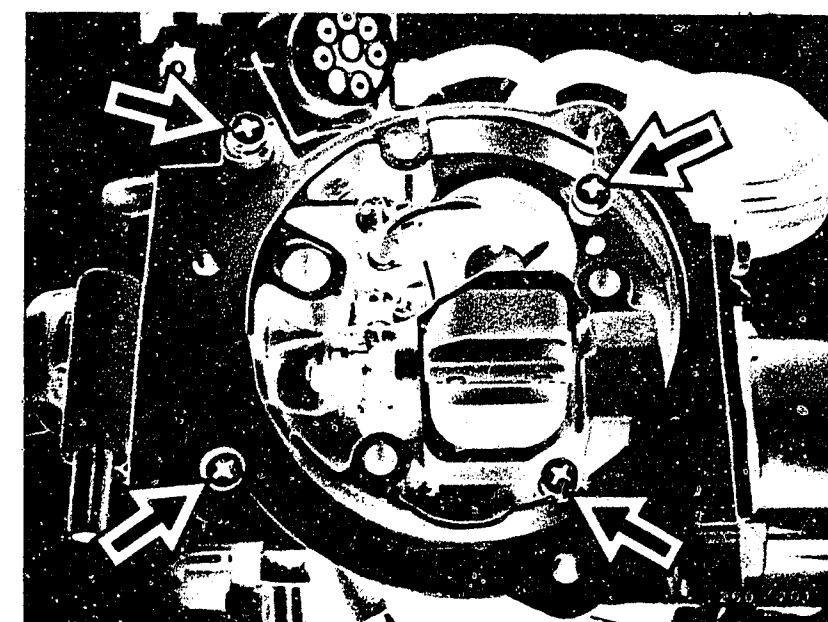
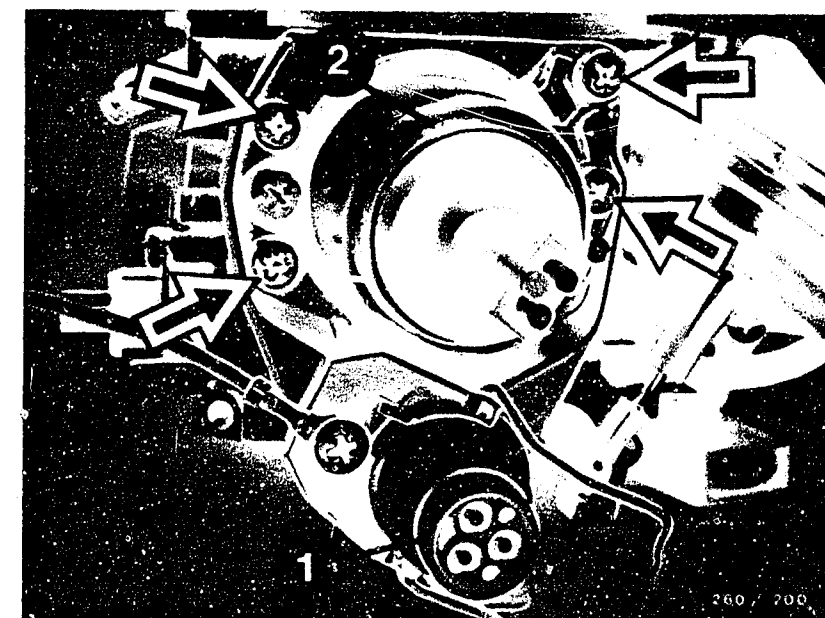
Remove all plastic parts (including filter in fuel inlet).

Clean die-cast and steel parts in suitable carburetor cleaning solution.

After cleaning, wash all parts with white spirit (DIN 51 632).

Blow out holes and channels with compressed air.

Make sure that all moving parts are freely movable.



H5

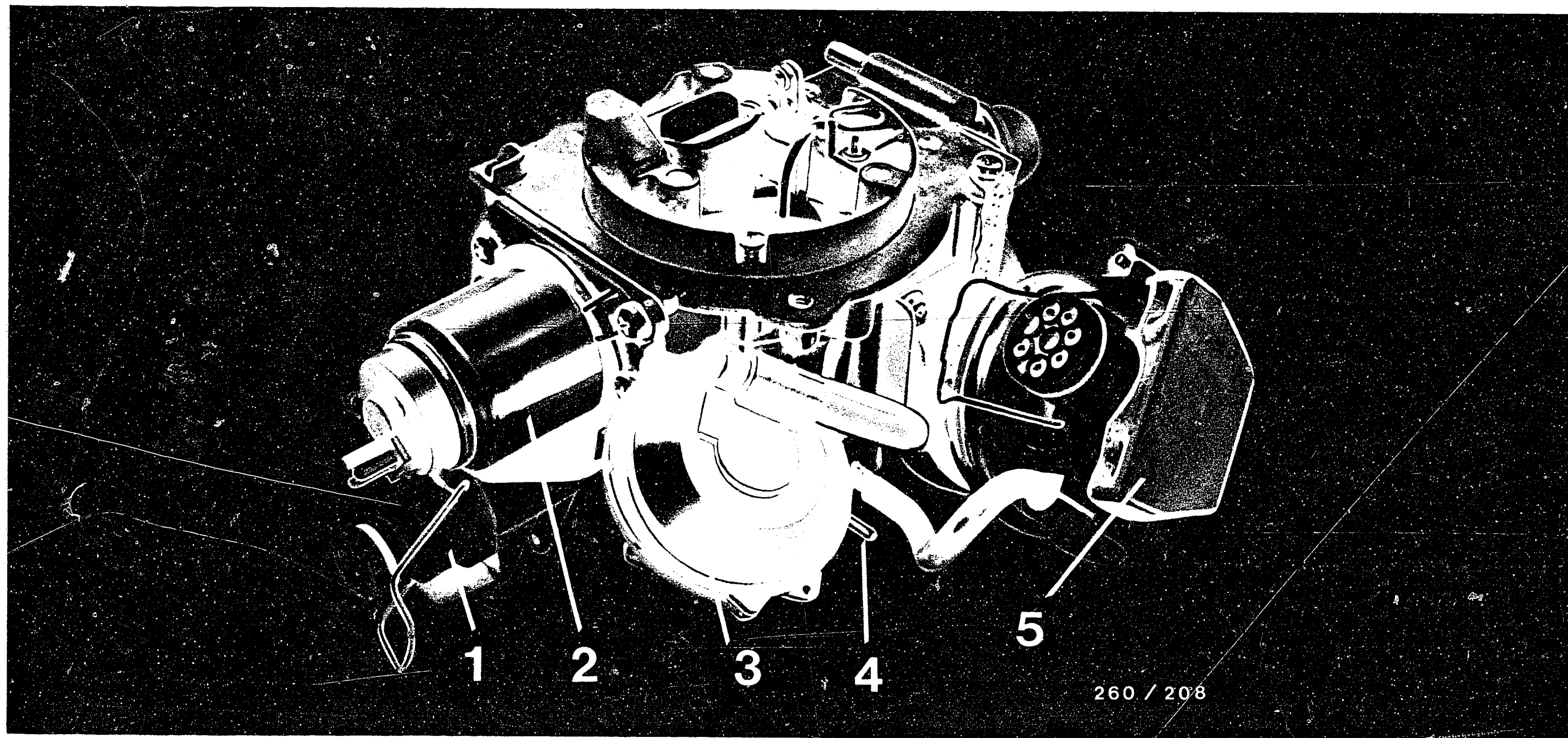
Corrosion/dirt in carburetor
Mercedes-Benz



H6

Corrosion/dirt in carburetor
Mercedes-Benz





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Construction of Ecotronic carburetor

- 1 = Throttle-valve potentiometer
- 2 = Choke-valve actuator
- 3 = Stage II aneroid capsule

- 4 = Vacuum port
- 5 = Throttle-valve positioner

H7

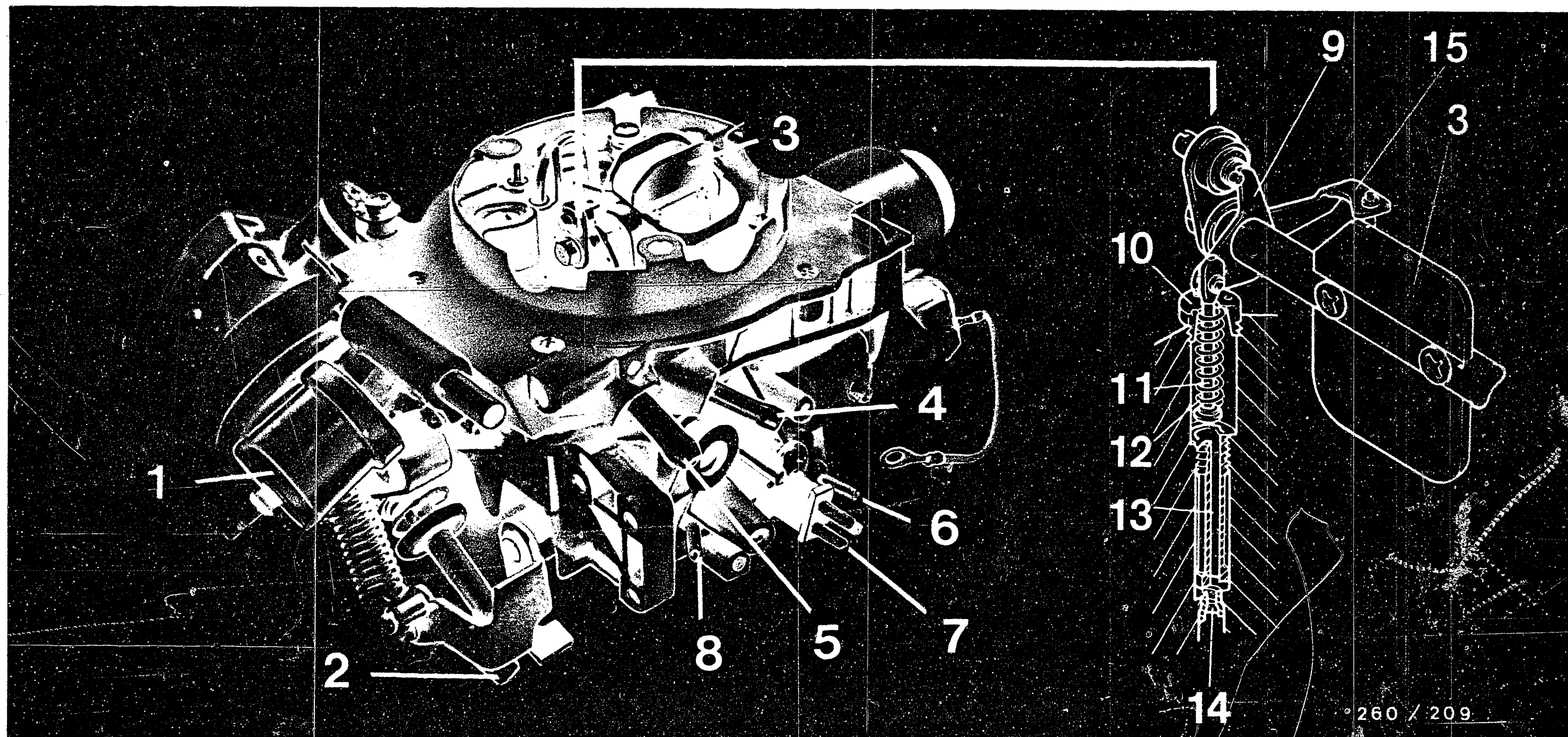
Construction of Ecotronic carburetor
Mercedes-Benz



H8

Construction of Ecotronic carburetor
Mercedes-Benz





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Construction of the Ecotronic carburetor (continued)

- | | | |
|---|---|-------------------------------------|
| 1 = Float-chamber switch-over ventilation valve | 6 = Control connection for regeneration of an activated-carbon filter | 11 = Idle-air correction needle |
| 2 = Throttle lever | 7 = Bypass heating | 12 = Compression spring |
| 3 = Choke valve | 8 = Regeneration port | 13 = Mixing tube |
| 4 = Fuel return | 9 = Lever for needle control | 14 = Idle nozzle |
| 5 = Fuel inlet | 10 = Idle-air nozzle | 15 = Lever for overspeed protection |

H9

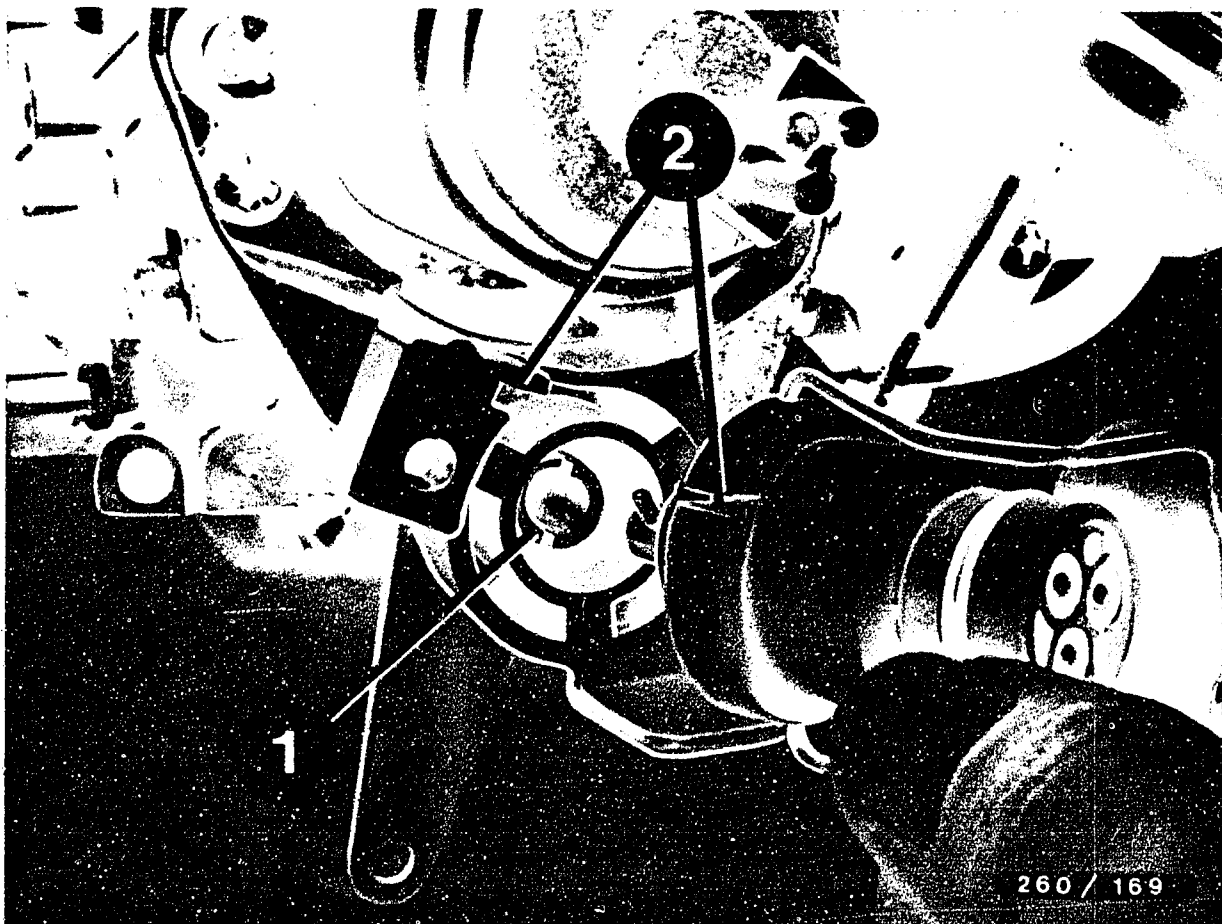
Construction of Ecotronic carburetor
Mercedes-Benz



H10

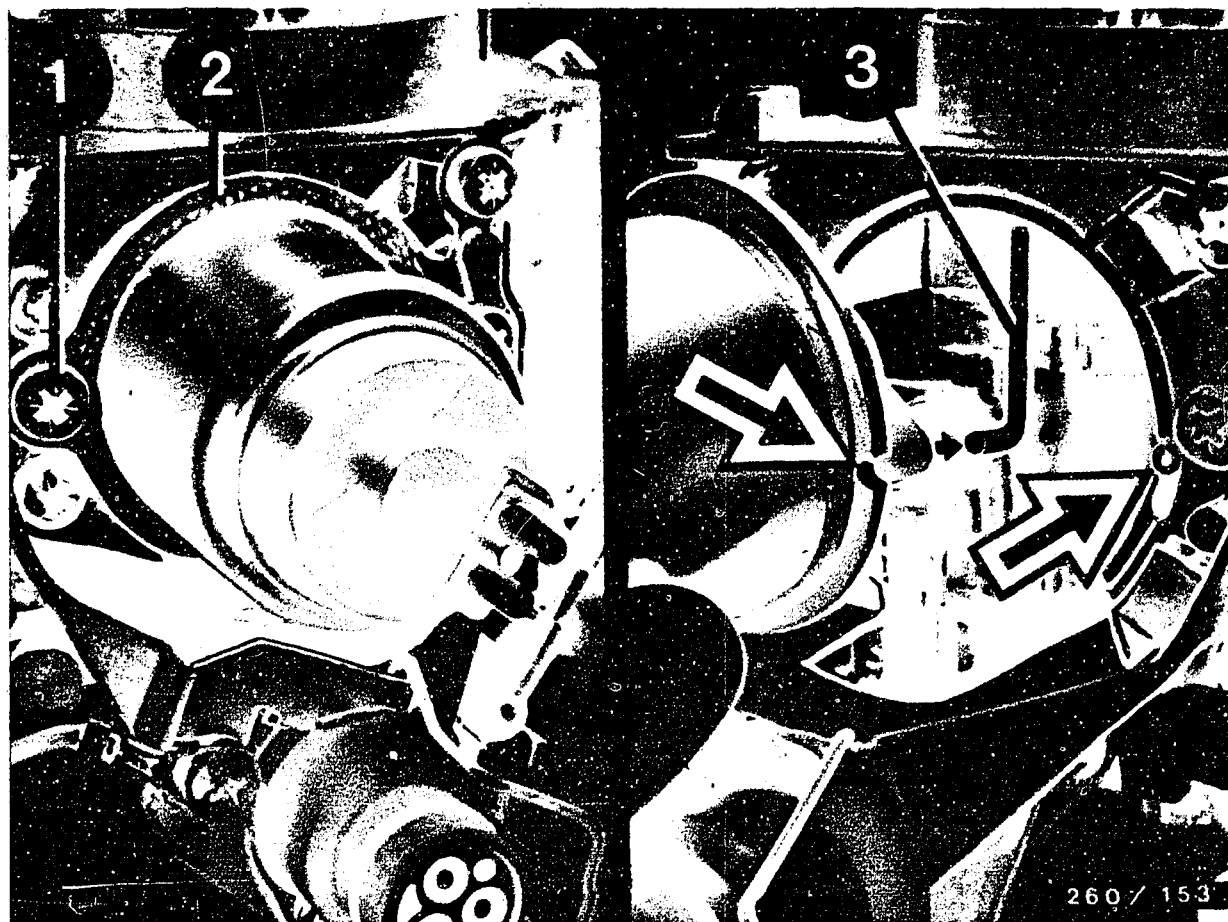
Construction of Ecotronic carburetor
Mercedes-Benz





- Assembling carburetor

When mounting throttle-valve potentiometer take note of coupling (1) and detent (2).



When mounting the choke-valve actuator, pay attention to detent (arrow) and linkage rod (3) to choke-valve plate.

Spray WD 40 or Unispray "Termal" into carburetor to protect against corrosion.

Replace carburetor.

Tightening torque for affixing carburetor: 7 Nm

Restore all electrical and hose connections. Mount air filter. ♦

Check idle CO, or check lambda closed-loop control range. If necessary, set at idle-mixture-adjusting screw to

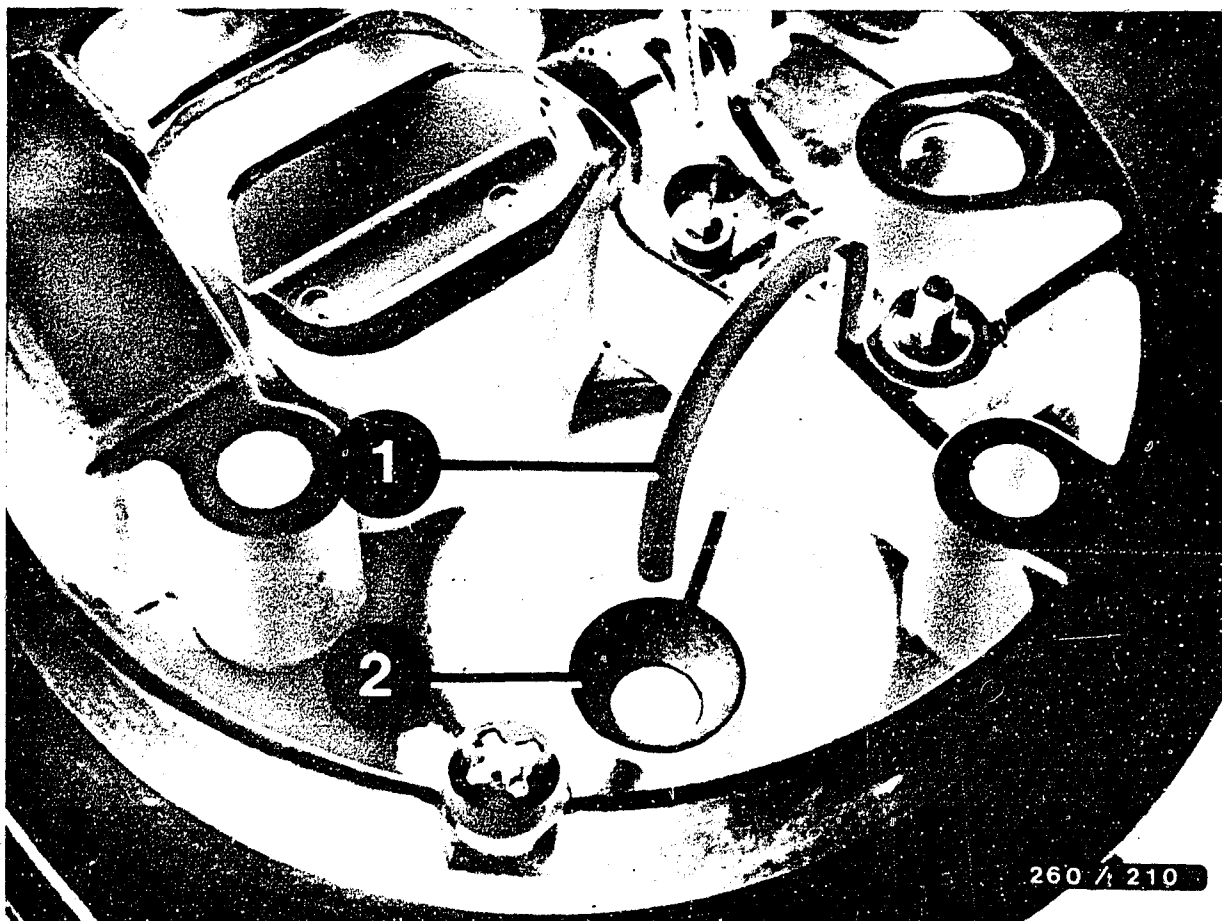
1.0 ± 0.5 vol. % CO; or

5 ... 7 V (oscillating around open-loop control value)
 $50\% \pm 10\%$ (lambda closed-loop control tester).

H12

Corrosion/dirt in carburetor
 Mercedes-Benz





11.24 Checking enrichment tube

The outlet of the enrichment tube (1) points vertically down to the middle of the boost venturi (2).

Height above boost venturi: $13.5 \pm .10$ mm

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3. Test specifications.....	A 14
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